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The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

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JANUARY, 1927

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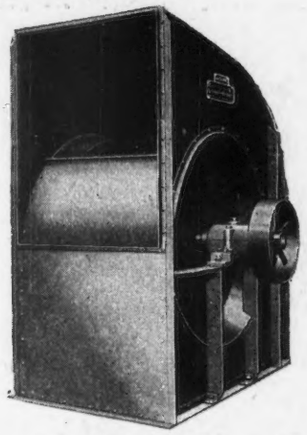

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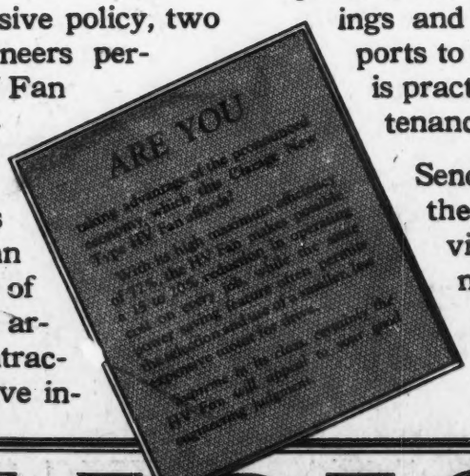

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The Heating and Ventilating Magazine

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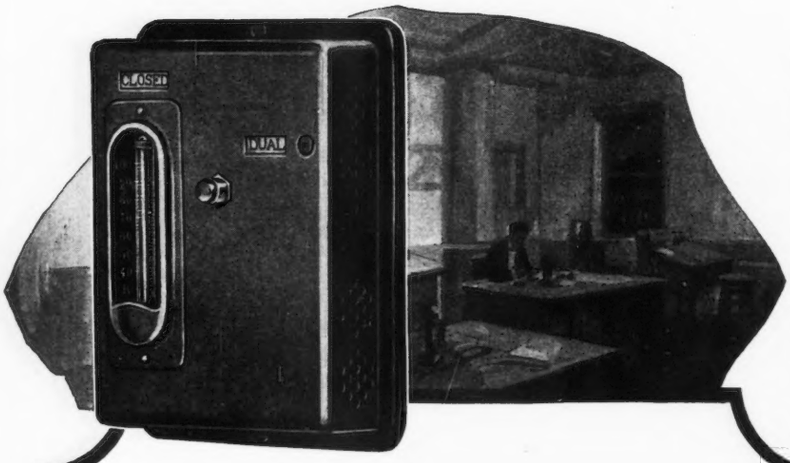

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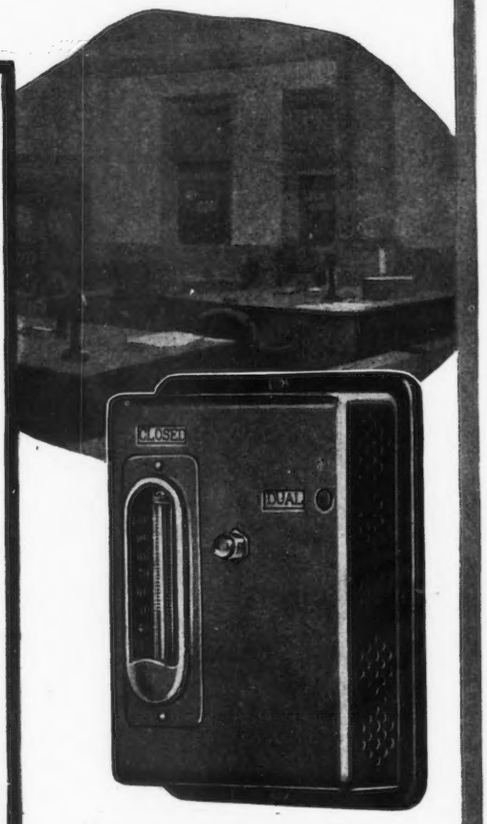

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The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

JANUARY, 1927

The Future of House Heating

Community Heating as a Possible Solution of the Difficulties Arising from the Use of Various Fuels

By Harold L. Alt

WHAT is to be the future heating of the American home? This is a question being agitated to-day by some of the largest business interests in the nation. The home *owner* is vitally interested, the home *renter* is nearly as much so, and the heating contractor and manufacturer of heating appliances both must see their livelihood seriously modified by the way the public is going to decide this question.

And the public is going to decide! The most that can be hoped for is that the decision will be an intelligent one and that it will be made in a manner suiting the best interests of all concerned.

While the public is the real arbiter of this matter, everyone connected with home heating in any capacity carries an obligation to do everything possible to point out to the uninitiated the good points and the bad of the various questions involved so that the decision will be based on reason and common sense.

It is the purpose of this article to consider and describe the various solutions that seem possible and feasible as an answer to the question, but it is still far too early in the game to prophesy the winner or how the decision is going to fall.

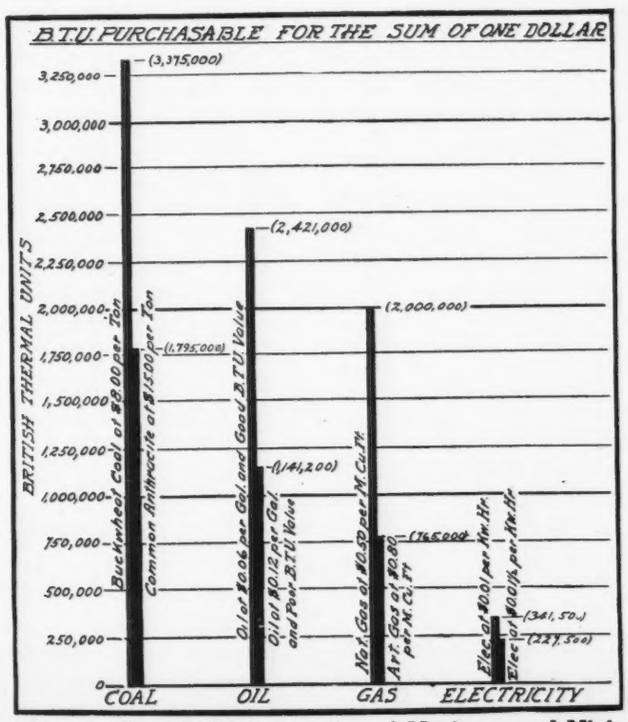


Fig. 1. Graphic Representation of Maximum and Minimum B.T.U. Which Can Be Purchased for One Dollar

REASONS FOR COAL LOSING FAVOR

Up to very recently the coal interests, and particularly the anthracite division, have had the house heating business almost without competition. That they do not occupy this enviable position to-day is quite apparent from the fact that the anthracite operators and dealers are perfecting plans to spend several million dollars just to try to maintain their present modified status. Their monopoly of the past is ended and

no one seems to realize it better than the coal dealers themselves.

This change in the matter of coal for home heating has not been the result of any one factor but, on the contrary, has been produced by a number of causes, all tending in the same direction.

The difficulty of procuring coal during the war was the first factor. Numerous strikes making it difficult to obtain coal under any conditions was a strong second. Dirt, dust and ashes always have been an objection and have contributed their quota. The increasing cost of labor for fire attendance and a disinclination on the part of home occupiers to shovel coal and dispose of ashes has produced a dissatisfaction with coal. Increasing prices, making the fuel more expensive in many localities and doubling the cost in the last ten years, has given a very material impetus to finding a more satisfactory substitute.

For this reason all over the country are found occupants of homes who are in the frame of mind to "try anything once." And they provide a fertile field and good sales prospects to any salesmen who can offer them something which seems to have the possibility of relief.

Even with all of these handicaps coal is, by far, still the leading fuel for homes, this being due partly to many old installations so arranged that nothing besides coal can be burned in them without expensive and radical changes. But in the new work, now in progress of construction, the adoption of coal is by no means encouraging. It is probably safe to say that coal hardly has a fifty-fifty chance on new and modern houses.

RISE OF OIL HEATING

Next to coal is a fuel which is a newly-risen star in the house-heating field, viz., oil.

The use of oil for heat production is by no means new in industrial, railroad and steamship work, but its entrance into the house-heating field was necessarily delayed until the automatic oil burner went on the market, making this fuel a practical consideration for "home consumption."

To-day the number of designs of oil burners is legion and still other new types are almost daily arrivals. If oil does not win out it cannot be said to be due to the lack of variety in burners.

OTHER SOLUTIONS OFFERED

Quick to see the possibilities of the home-heating situation were the gas companies who, in a multitude of cases, already were supplying gas to the houses, had street mains all laid, and gas producer plants in operation. They were actually selling gas as a cooking fuel and as a water-heating medium, in many homes becoming dissatisfied with coal heating.

Electric heating as well showed considerable activity and, especially on the Pacific Coast, has made actual and substantial gains. Numerous articles have appeared in the technical and news press telling of the success and satisfaction these heating systems are giving but, so far, their application in the eastern States has been negligible.

The district steam-heating interests, thus far, apparently, have made little effort to go after house business, although this is not so difficult to understand when it is realized that there are no big commercial or business interests which would gain much by trying to get the house-heating business. District heating for homes is usually a community and co-operative proposition.

Unless some entirely new method of heating or fuel is developed, with marked advantages over the ones already mentioned, it is safe to say that one of these five methods is going to get the majority of the house-heating business. Coal, oil, electricity, or gas? It is really only a four-man race, for district heating must employ one of these four and, therefore, it is more a method than a fuel.

ARGUMENTS AGAINST PRESENT FUELS

Objections to coal are almost too well known to need repeating; dirt, dust, ashes, increasing cost, unreliable supply due to strikes, storms or transportation delays, labor of firing, lack of immediate response to control by drafts, smoke, gases, space for storage—can coal win out with all these disadvantages?

Oil, however, is not ideal either and has its troubles: higher cost, variation in quality, fire and explosion hazards, storage tank installation, multiplicity of burner designs, noise from burners, ignorance on the part of operators, apparatus not designed for oil. Can oil win out against all these odds? Perhaps.

Gas, what about gas? This fuel also labors under severe handicaps if generally adopted as a heating fuel: present mains of insufficient size, no plant capacity for heavy winter load, frost in pipes, drop in pressure when winter load increases, resulting in insufficient supply when needed the most. Can gas win out?

Electricity has only one handicap but it is a nearly insurmountable one, especially in these days of high living costs. This is the almost prohibitive cost. But power wiring is comparatively inexpensive to install and there is plenty of capital behind the big electric-public-service companies to take care of the production and transmission of the current from the electric generating plant to the house meter without investment or other financial load to be carried by the home occupant.

Inside the home, electric wiring is a cheap and convenient means of carrying heat to the various rooms. No storage of any character need be provided. No valuable space is occupied by apparatus. The electric heaters are small and not objectionable in appearance. Control is easy, immediate and positive.

Electricity, however, is a most inefficient form of heating, giving back, in the form of heat, only a very small percentage of the B.T.U. originally contained in the coal and it is this inherent defect

which makes the cost exhorbitantly high. Possibly hydro-electricity, in some cases, will put electric heating on the map, but, in localities far from waterpower, can electricity win out? We wonder.

SUCCESS OF COMMUNITY HEATING

District heating, what about that? Is district heating going to be the answer? If powerful business interests were back of this proposition, the reply might be in the affirmative, but, so far, the district heating scheme has been limited largely to two classes of business: first, where a large public service monopoly supplies a downtown district of big buildings; and, second, to the little community plant built by private interests to serve a small group of houses or a cluster of buildings, all under one ownership, such as a university or school development.

Yet, in localities where district heat has succeeded in getting a try-out it seems to have been surprisingly successful. Its users are enthusiastic and nearby home-owners are eager to be put on the steam mains if they have been so unfortunate as not to have been included in the first group supplied.

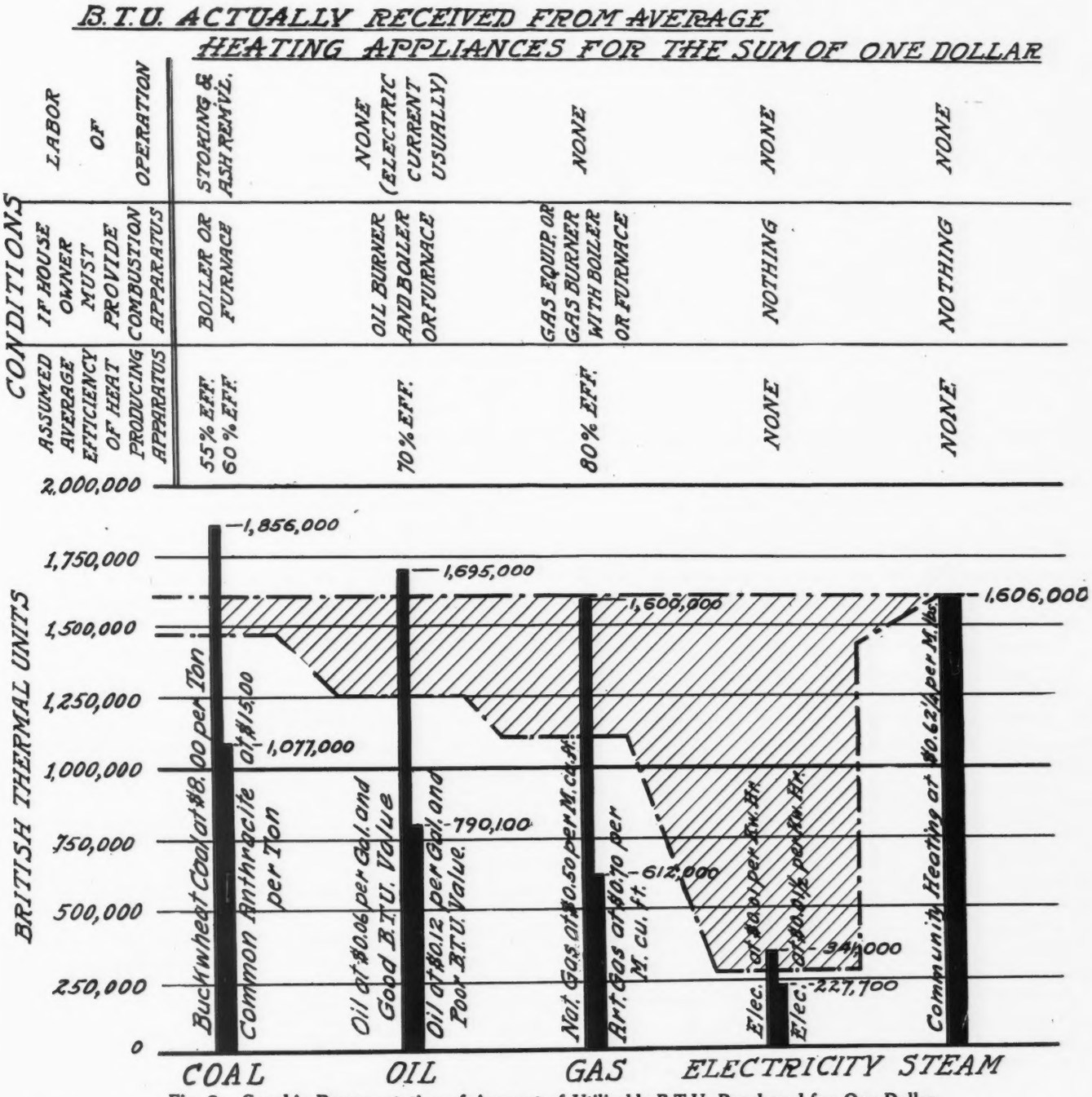


Fig. 2. Graphic Representation of Amount of Utilizable B.T.U. Purchased for One Dollar and Line of Average Compared with Community Plant

PROBLEMS OF DISTRICT HEATING

Difficulties lying in the way of district heating for homes, and which must be overcome before such a service will prove attractive to the average home owner, consist of providing an adequate

boiler house, financed and operated by a dependable company; obtaining a franchise and laying street mains by such a company; and a reasonably safe and sure guarantee that the plant will be operated in a satisfactory manner. In many cases, all of this is not only going to be difficult to carry out, but will also take time even if brought to fruition ultimately. And yet it would be fool-hardy for anyone to state now that district heating *cannot* be the answer, for it can.

In spite of all the difficulties in the way, district heating has some very striking advantages to offer. It is, in fact, the only method of heating, outside of electricity, not requiring a heat-generating apparatus in the basement—a saving to the home builder and home purchaser of quite an amount of money. It is, also, the only system giving almost all the efficiency of coal without the disadvantage of dust, dirt, handling and fire attention. By efficiency of coal, the B.T.U. delivery is meant. This will be discussed in detail a little further on.

It is true, electricity has the same advantage in not requiring a heat-producing plant in the home, but electric generation in a central station requires much more apparatus, expert engineers and long transmission lines, whereas district heating can come from a comparatively low-pressure boiler plant located near the points of utilization and attended by an unlicensed engineer.

CHART OF B.T.U. PURCHASED FOR ONE DOLLAR

An instructive and illuminating way of looking at this subject will be found by referring to Fig. 1, which presents graphically the number of B.T.U. which can be purchased with $1.00, invested in the different ways possible at the present time.

Anthracite coal has been assumed as having 13,500 B.T.U. per pound, and as being delivered to the home and placed in the cellar at a price of $15.00 per ton of 2000 lbs. Buckwheat has been taken at the same B.T.U. value and a price of $8.00 per ton of 2000 lbs., while oil has been considered, from a maximum of 28° to 30° A.P.I., at a low price of $0.06 per gallon, to the other extreme of "furnace-oil," at the high price of $0.12 per gallon. The B.T.U. per gallon for oil have been assumed as 146,000, maximum, down to 137,000, minimum.

Natural gas has been assumed as costing $0.50 per 1000 cu. ft., each cubic foot having 1000 B.T.U. With artificial gas, the price of $0.70 per 1000 cu. ft. has been assumed, and each cubic foot has been considered as having 535 B.T.U.

For electricity, a power rate of $0.01 to $0.01½ per Kw. hour has been taken with each Kw. hour developing 3415 B.T.U.

CHART SHOWING B.T.U. RECEIVED FOR ONE DOLLAR

This chart (Fig. 1) shows an enormous balance in favor of coal, but friends of coal, oil and electricity urge that this is not a fair comparison, owing to the fact that greater economy is secured in the application of these methods. So, to meet the objection, it will be necessary to take into consideration this fact and another chart (Fig. 2) has been prepared, this chart being based on the B.T.U. purchased for $1.00, as shown in Fig. 1, but multiplied by the average efficiency of the various methods of application.

For instance, with coal, as fired in the ordinary warm-air furnace or steam or water boiler, the average efficiency is almost 60%. With anthracite coal used in such a device under proper conditions, the actual delivery of B.T.U. into the warm air, steam or water is 60% of the total B.T.U., or, in the case under consideration, 60% of 1,795,000 B.T.U., which equals 1,077,000 B.T.U. With buckwheat coal, owing to the increased draft that must be maintained, an efficiency of 55% has been assumed, giving 3,375,000 B.T.U. × 55%, or 1,856,000 B.T.U.

For oil, an efficiency of 70% is allowed, this being about the average overall boiler and burner efficiency, which gives 2,421,333 × 70%, or 1,694,933 B.T.U. as a maximum for oil, and 1,141,666 × 70%, or 799,166 B.T.U. as a minimum.

Natural gas has been allowed an efficiency of 80%, which makes 2,000,000 B.T.U. × 80%, or 1,600,000 B.T.U., while artificial gas gives 765,050 B.T.U. × 80%, or 612,040 B.T.U.

Electricity, not being produced in the home, has no losses to sustain and the same can be said of district steam or community heating.

In connection with community heating, a small plant operating in Decatur, Ill., is an example of just the sort of scheme which may solve the question of home heating. This plant has run for four winters and is on a co-operative basis. The cost of steam produced is $0.62¼ per 1000 lbs., and this price includes a 10% allowance for depreciation, but no profit.

This community steam, at $0.62¼ per 1000 lbs., has been plotted in Fig. 2 so as to show how many B.T.U. the utilizer would have delivered to him for $1.00 when purchasing steam at this rate from a similar plant. There is no use saying this is an impossible condition, or anything like that, for the answer to this is simply that it *is* being done, *and has been,* for the past four years.

AVERAGE COSTS TAKEN AS A MEANS

It is now possible to draw a line midway between the anthracite level and the buckwheat level, and to call this an average cost for coal. Similarly, a line drawn midway between the maximum and minimum heat deliveries for oil can be called an average for oil; following the same scheme for gas, electricity and community steam, the result then appears as shown in Fig. 2, by the dot-and-dash line indicated.

If this line is now carried from the community steam line horizontally back to the coal line, it will be noted that electricity cannot at all compete, artificial gas is way behind, natural gas can just touch the line, oil, in its very best quality and at the very

(*Continued on Page* 68)

The Mechanical Ventilation of the St. Louis Schools

AN ENGINEERING STUDY

By Edwin S. Hallett

Chief Engineer, St. Louis Board of Education

Part II

THE real test of the value of better ventilation in its effect upon the health and comfort of the community must extend over a period of time and include a large number of individuals. The school authorities do not collect statistics upon either health of pupils nor the death of children of the schools, but the Health Department of the City of St. Louis does make a very instructive report in the comparison of the death rate of the city with other large cities, in which the causes of death are segregated.

Fig. 3. Example of Concrete Air Duct Construction, Beaumont School, St. Louis, Mo.

I have prepared graphs of the twelve largest cities, showing the total death rate per thousand, which places St. Louis in the fourth place from the bottom. In that order Cincinnati reports sixteen deaths per thousand in 1925 from all causes; then come Boston, Baltimore, Pittsburgh, St. Louis, with 13.8 deaths per thousand and up through the table to Cleveland, with 10.36 per thousand.

In the face of this bad showing for St. Louis, all the diseases affected by ventilation are lower in St. Louis than in any other city of the group. The graph includes tuberculosis, pulmonary and all other forms, and influenza.

This is a startling discovery. Every natural environment of St. Louis would place her standing in these pulmonary diseases at the bottom of the table. The heavy smoke pall, the low quality of our fuel, the great number of brick and ceramic works and the railroad congestion in the heart of the city—all mitigate against respiratory diseases, and yet she stands with a lowest death rate from these causes.

HOW HEALTH OF SCHOOL PUPILS AFFECTS VITAL STATISTICS

How does the health of the schools affect the vital statistics of the city at large? Of the total enrollment of 120,000 persons in school, more than 80,000 are protected during the school day by the improved ventilation of the schools. The St. Louis schools have a much larger percentage of her population in ventilated schools than has any other city. This is the largest contact of the population to any measure directly planned for preserving the health. It will require more time to prove the value of the effort but, since all the indications are in the right direction, our duty is clearly defined in producing schools with the most perfect ventilation that can be devised, as outlined in the former paper.

THOROUGH CONTROL THE SOLUTION

The control of heat, humidity, air motion and ozone, with means for removing the injurious portion of air, and apparatus for producing proper distribution sums up the problem of the ventilating engineer. Heat control in industry is the greatest achievement in recent years in promoting efficiency. The control of moisture is the *sine qua non* of the textile industry. The summer box receipts of theatres are wholly dependent upon controlled air motion; every industry using delicate paints and varnish must shield its quarters from dust and fumes by dry air filters and air washers. While ozone has had considerable commercial use, it is unknown to many who will shortly discover it. It is the greatest water purifier, and all drinking water ought to be treated with it.

Thus industry has been quicker to seize upon the several elements of ventilation than have the ventilating engineers themselves. No industry could survive the present competition, that used any such hit or miss practice as that proposed for ventilation by the New York Commission. The practice of medicine was once followed as a side line by the barbers. That is what some would do with the science of heating and ventilation to-day. The leadership of the engineering field is in the hands of men of scientific training and vision equal to that of any field. They have the rare opportunity

of making the fundamental alignments that shall guide future growth. The unselfish support of the A. S. H. & V. E. Research Laboratory by the whole membership of the society proves their high character.

The writer has devoted ten years of study and experiment and has used all research results in the development of school ventilation that should satisfy the strict conditions set out above. It seems the best method of combating an error is to provide something to make a demonstration of the truth. The schools built within the past three or four years all stand as at least a near approach to the ideal. As the Beaumont High School is to be visited by the delegates to the annual meeting of the American Society of Heating and Ventilating Engineers, it is presented in some detail.

THE BEAUMONT HIGH SCHOOL

The Beaumont School was completed and occupied February, 1926. It is similar in many respects to the Roosevelt School which was completed a year earlier. This school is located in the north section of the city on about 12 acres of ground and the building covers nearly four acres. It has a cubage of about five million cubic feet, and accommodates 3000 to 4000 pupils in the regular day sessions and nearly that number in the evening schools, with an auditorium of 2500 seats which is used simultaneously for either high school or grade school events, or community activities.

The building encloses a light area in the middle of which the auditorium is placed so that the stage is integral with the gymnasium group and is used for the exhibition games of basket ball. The ground floor beneath the light area and auditorium is a lunch room seating 1500.

THE NEW TYPE OF VENTILATION

The design of this plant contains many innovations. A power plant is built integral with the heating system, consisting of two 350-H. P. cross-drum water-tube boilers, with chain grates, only one of which will ever be used at a time. A 200-K. W. and a 150-K. W. generating unit are ample for lighting and power, a small gasoline-driven generator is provided against an accident to the steam plant. The power is generated as a matter of economy since most of the exhaust steam is used for heating and other purposes and enables us to have 220-volt and 110-volt direct current which is more suitable for variable-speed motors which are used on fans and shop motors.

No direct radiation is used.

SIMPLICITY OF AIR DISTRIBUTION

It is impossible to conceive of a more direct method of air distribution for the heating and ventilation of all class rooms and the auditorium. The building has a system of circuit corridors giving access to all rooms and laboratories. Beneath the ground floor corridor is an air duct of concrete about 7 ft. high through which all the air from the fans is carried. (See Fig. 3.) The building is ventilated in three units, the east half, the west half and the auditorium. Three fan units with the Vento heating coils of 70,000 C. F. M. each and exactly alike, are set side by side facing this air tunnel. Steel doors are arranged so that any one or any combination of fans may be used for heating a single unit or all. The loss of a fan temporarily would not disturb the service.

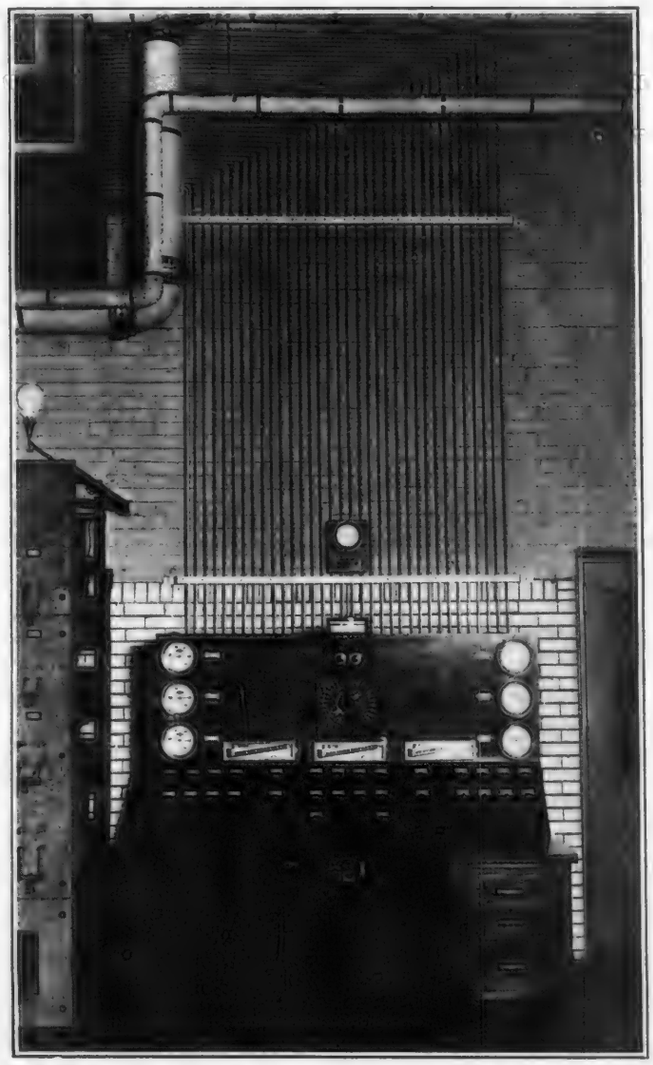


Fig. 4. Control Desk, Showing Long-Distance Wet and Dry Bulb Thermometers, Beaumont School, St. Louis, Mo.

The backward-curved blade fan is used for two reasons: They have proven to be much more economical of power; in varying the resistance they do not overload, and they are sufficiently silent.

This tunnel is a great plenum chamber of warm air and the absorption of heat in the concrete surfaces is a stabilizer of temperatures. The air distribution from this duct is by galvanized-iron vertical flues 12 in. x 48 in. at the base and contracting 12 in. at each room diffuser, there being two of these to each tier of rooms. These pass up in a slot or hollow wall, and the unoccupied space in this wall serves as a conduit for the return or vent air.

No exhaust flues are

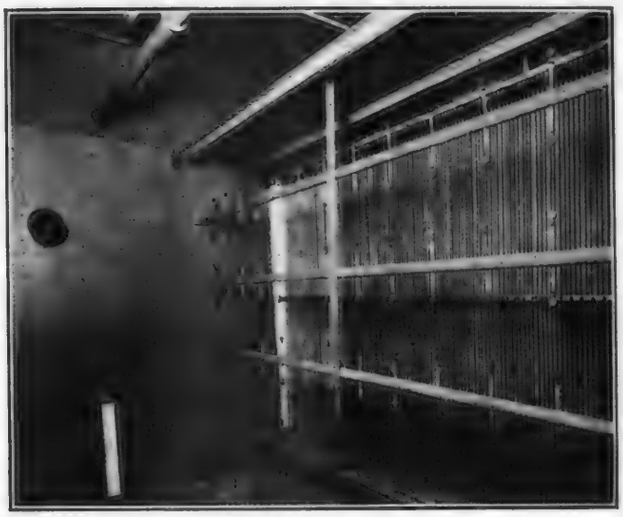


Fig. 5. Interior of Air Washer Unit With Nozzles Close to Top, Beaumont School, St. Louis, Mo.

provided until the attic is reached, where an insulated duct gathers the air from all these hollow walls and carries it back and down to the intake of the fans in the recirculation circuit. No horizontal ducts are used except for returned air which is to be recleaned.

Vacuum cleaning outlets are provided in the tunnels as in class rooms and they are regularly swept. This tunnel also serves as a means of distribution for steam, water, electric conduits, air for regulation and laboratories, etc. The waste heat of the smoke stack is utilized for the new or makeup air lost in the leakage of the building. Two stacks are carried above the roof for taking all fresh air when not recirculating, especially in warm weather. The dampers controlling this change are operated from the engine room by remote air control.

AIR VELOCITIES

Most engineers have assumed that a constant air velocity in school rooms was necessary or at least desirable. The writer discovered that it was neither necessary nor desirable to have a uniform air motion, providing disagreeable extremes were avoided. A little study at this point has thoroughly and permanently settled this question.

The air velocities through the Vento heaters in the Beaumont School vary with the speed of this fan, of course, but are about 800 to 1000 ft. per minute; through the tunnels, about 500 ft. per minute, and in the riser flues about 800 ft. per minute. The pressure loss in the complete circuit is very low. It seems to be about $\frac{5}{8}$ in. to $\frac{3}{4}$ in. water gauge.

TEMPERATURE CONTROL

The engineer reader may be wondering how the temperature control is to be secured. That was the problem to be solved before this otherwise acme of simplicity could be used.

A new form of apparatus was devised for this and other high schools having similar ventilating systems, namely the control desk. Temperature regulation is a highly specialized and perfected piece of equipment. It is more sensitive to temperature than a person and its control is dependable within a degree. Yet its use and success requires supervision. It was considered a justifiable expense to install such long-distance wet and dry-bulb thermometers that this information could be read at the control desk for various parts of the building. The comfort of 3000 to 4000 persons is of sufficient consequence to justify this. This desk is also equipped with air-duct pressure gauges, and remote air control for all steam Vento coils not under automatic control, and distant dampers not thermostatically controlled. (See Fig. 4.)

ROOM TEMPERATURE CONTROL

The temperature of the air passing through the Vento coils into the tunnels is controlled by thermostats placed in the two most exposed rooms, in this case, a second-floor northwest room and a second-floor northeast room. A thermostat is placed in each key room and apparatus is provided to open a by-pass damper under the Vento coils for the side of the building controlled by that particular key room. This is a graduated thermostat and as the temperature reaches 66° or 67° F. the damper begins to open. This permits a portion of the air to by-pass the heaters. Another thermostat is placed in this room which shuts off the steam in one of the four stacks of heating coils. This can be set at 65° F. and is sufficient for controls. Some would prefer to have all coils on thermostatic control but I prefer not. The other three stacks are controlled from the control desk and need attention only in larger changes of temperature. The scope of this will be quickly grasped by the engineer.

This control will maintain any predetermined temperature in this most-exposed room and, of course, would make all the other rooms too warm. Thermostatically-controlled diffusers are installed at the air inlets which restrict the air flow to that

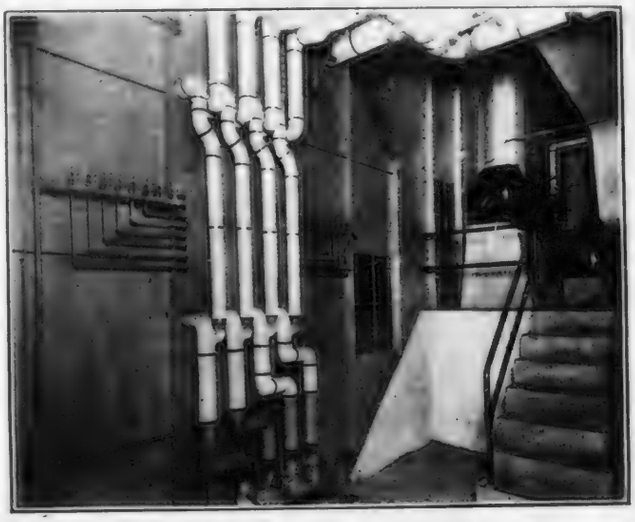


Fig. 6. Fan Housing and Pipe Connections for Heaters, Beaumont School, St. Louis, Mo.

which is required to heat the other rooms. Since the air temperature is but slightly above that required to heat the room at full flow the restriction will not be much and will cause the diffuser to oscillate on a short arc.

After about two years service in the Roosevelt High School this system has given far better regulation and satisfaction to the teachers than the old mixing-damper system of the other high schools. There is about 6° difference in temperature between the bottom and top of the air tunnel due to stratification and that was met by taking the air on the side near the heaters from near the floor. Deflecting baffles were not satisfactory.

The air washers are standard make except that a line of nozzles is placed close at the top to wet the scrubbers only. (See Fig. 5.)

Fig. 6 is a side view of a fan housing. Observation windows are placed in various places to enable the school officials to see the plant in operation and to use it for educational purposes.

No ladders are required to reach any service valve. The engineer can see his whole plant from one position. The entire building could be operated by two men at a time, if necessary.

The next paper will be devoted to the remarkable economy resulting from this design, the low cost of building, the lower cost of fuel and the absence of repairs for many years.

The Future of House Heating

(*Continued from Page* 64)

lowest price, just makes the grade by rising slightly above this line, and anthracite coal is hopelessly below. Only a buckwheat proposition can offer anything which exceeds community heating by very much.

EFFECT OF INITIAL INVESTMENTS

Now let us see what other factors may enter into the proposition to tip the scale to one side or the other. The diagram, Fig. 2, seems clearly to indicate that both electricity and artificial gas are out of the serious running, owing to high cost.

While the home-owner often looks at the operating cost of a heating plant, it is a well-known fact that the first cost is often a more *immediate* feature and, on account of its *immediate characteristic*, receives more attention relatively than it should. This is because the owner must pay the first cost at once, but the operating cost is a matter which need not be met until in the years to come.

There is also the "speculation-built" home, where the builder is doing everything to cheapen first cost and never intends to live in the house or to operate it himself.

Referring back to Fig. 2, a horizontal column is found near the top, entitled "If house-owner must provide combustion apparatus." This column shows what heat-*producing* (not heat-emitting) apparatus the owner must supply when the various systems are installed.

For buckwheat coal, he must provide a special buckwheat-burning apparatus — possibly with a blower—or, perhaps, with an unusually high chimney. Such equipment almost invariably costs more than the ordinary boiler or warm-air furnace suitable for the usual sizes of coal. For ordinary anthracite coal, he must purchase a common boiler or warm-air furnace. For oil, he must not only buy a boiler or warm-air furnace, but, in addition, must invest in an oil burner, with the accompanying tanks, piping, etc. To use natural gas, the owner has the alternative of buying a regular boiler (or warm-air furnace) with gas burners applied thereto, or purchasing a regular gas-fired apparatus built for gas alone. Manufactured gas offers the same alternative.

But community steam requires no initial investment of this sort.

The appeal of community steam to the builder and to the purchaser, the advantage of additional cellar room, the economy and convenience, can all be realized. But this is not all.

EFFECT OF CARE, ATTENTION AND LABOR OF OPERATION

Referring to the top horizontal column in Fig. 2, headed "Labor for Operation," this column shows that the coal-fired proposition not only involves apparatus, but also requires stoking and ash-handling, both of which must be done or paid for by the owner—a *serious* matter to a *busy* man who is not too well off financially.

The oil firing eliminates the labor of operation, but introduces various inconveniences—maintaining a supply of oil at all times, usually a bill for electric current, as well as the most expensive apparatus installation of all the methods.

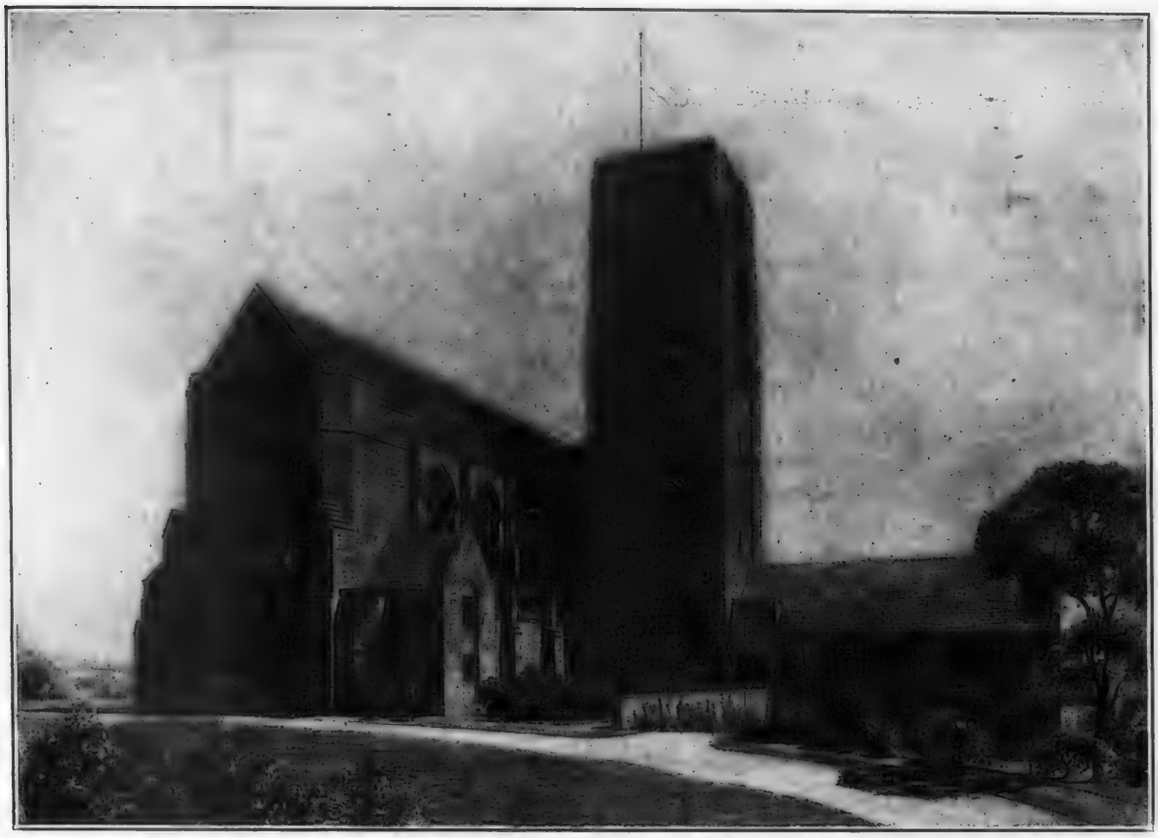
Natural gas has no labor difficulty, no stoking, and no fuel supply to be carried on hand. Where natural gas is available, it is practically as good as community steam, except that it requires the purchase of a heat-producing apparatus.

Community steam sold by the pound has no labor in connection with its operation and *no apparatus cost.* It is the only scheme of which this can be said, outside of electricity, which has already been shown to be out of the question, on account of cost of operation.

LOGICAL MEANS TO BE USED IN VARIOUS LOCALITIES

All things considered, it seems logical to say that community steam—where possible to supply same—is the cheapest to install, cheapest to operate, and gives the least trouble. Where natural gas is available, it will be equally cheap to use and almost as satisfactory, but it requires apparatus.

In localities without natural gas, and where the use of community steam for any reason is impracticable, oil or buckwheat coal seems to be the most logical substitute, with coal winning out for cheapness and in cases where the owner is willing to do a little work himself for the sake of economy. In other cases, where convenience is paramount over a little additional cost, oil will qualify.



Bertram Grosvenor Goodhue Associates, Architects. Offner & McKnight, Consulting Engineers
Christ Church, Cranbrook, Mich.

Church Heating and Ventilation

Design Problems in Houses of Worship as Affected by Their Construction and Use

Part II

By Alfred J. Offner, M. E.
Offner and McKnight, Consulting Engineers, New York City

FOR larger church buildings, heating of the nave, chancel, and sanctuary by means of warm air is generally indicated due to the easier adaptability of this type of heating to interior design and the possibility of quick reheating. Unless there are windows in the lower walls or wall space is available, it is, as a rule, very difficult to place radiators so as not to clash with the beauty of the interior. With air heating there is also ventilation, the amount depending on the design and arrangement of the system.

Heating by air may be done by various methods, either by gravity or mechanical means. In larger buildings, the fan system will generally be found to be the more economical in the long run.

The warm air may be supplied by a fan, the vitiated air being allowed to escape by gravity, or the warm air may be supplied by gravity, the exhaust being taken care of by a fan. Or both supply and exhaust may be taken care of by one fan or independent fans may be provided for each system. The arrangement and system to be used depends on building conditions and the amount of money available for the heating and ventilating system.

While it is possible to introduce the warm air near the floor and remove the vitiated air at or near the ceiling, it will be found to be better in church work, as a rule, to introduce the warm air about half way up the building, under the large clerestory windows. The air is then exhausted at or near the floor, generally under or through the ends of the pews. Here again no fixed rule can be given, as the method of introducing and exhausting the air depends on the arrangement and design of the building.

In localities where the fresh air supply is contaminated, or the air is taken into the building close to dusty streets or roads, some means for filtering the air must be provided.

LOCATION OF THE VENTILATING SYSTEM

On account of the possibility of transmitting the sound of the moving parts of a warm air heating and ventilating system, care must be taken in locating this apparatus. Discretion should also be ex-

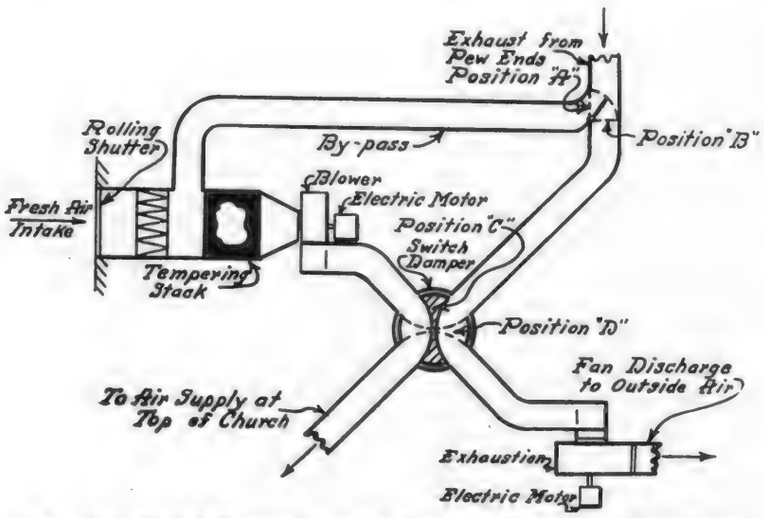


Fig. 11. Switch Damper Used for Reversing Downward Ventilation to Upward and Vice Versa

ercised in locating the boiler room, especially if oil is the fuel to be burned.

In sizing and selecting the warm air heating and ventilating apparatus, fans and motors liberal in size and slow running in speed should be used. Cork or other sound-absorbing material should be used under moving parts of the apparatus, so as to reduce the noise from vibration to a minimum. The duct connections to the inlet and outlet of all fans should be broken by a canvas connection to prevent the transmission of sound through the metal duct work.

Speed control, permitting the operation of the fans at various speeds, thereby varying the amount of air handled, is very desirable in church work.

If it is desired to use an oil-burning equipment, for firing the heating boilers, and the boiler room is so located that any sound from the oil burner, that could be heard would be objectionable, special consideration must then be given to this item. An oil burner must be selected not only giving proper working results, but one that will give the minimum amount of noise. As with the warm-air heating and ventilating apparatus, special precautions must be taken to reduce the noises to a minimum and prevent the transmission of sound to occupied parts of the church.

ARRANGE FOR RECIRCULATION OF AIR

The warm air heating and ventilating system shall be so arranged that the exhausted air can, at certain times be by-passed back to the supply system. This requires a connecting duct between the two systems and a form of switch damper permitting the easy by-passing of the air from one system to the other. Fig. 11 shows in a diagrammatic form such an arrangement. Position "A" of switch damper No. 1 being for normal operating conditions, and position "B" when the air is to be recirculated. This diagram also shows an arrangement by which, when switch damper No. 2 is in position "C" the system is ready for winter heating, air being supplied near top of church and exhausted at floor. Position "D" would reverse the operation, supplying the air near floor and exhausting at top, an arrangement suitable for summer ventilation.

It is very desirable that an arrangement be provided for permitting the recirculation of the air. This will result in saving fuel and quick reheating of the church, after periods of little or no heating.

Ducts and flues carrying tempered or heated air, for economy's sake, should be insulated. Flues concealed in stone walls must of necessity be installed in sections while these walls are built. Due to the slow process of building these heavy stone walls, parts of these flues and the insulation on same will at times be exposed to the weather. It is sometimes desirable to have the insulation on these flues encased by light galvanized iron to protect the insulation against damage. The top of each section of flue should be temporarily closed off during construction, to prevent them from receiving water, refuse, etc.

HEAT REGULATION DESIRABLE

Automatic heat regulation is very necessary and desirable, and should by all means be provided for, if the necessary funds are available. It will keep the principal rooms at the desired temperature, prevent over or under heating and will result in a saving of fuel.

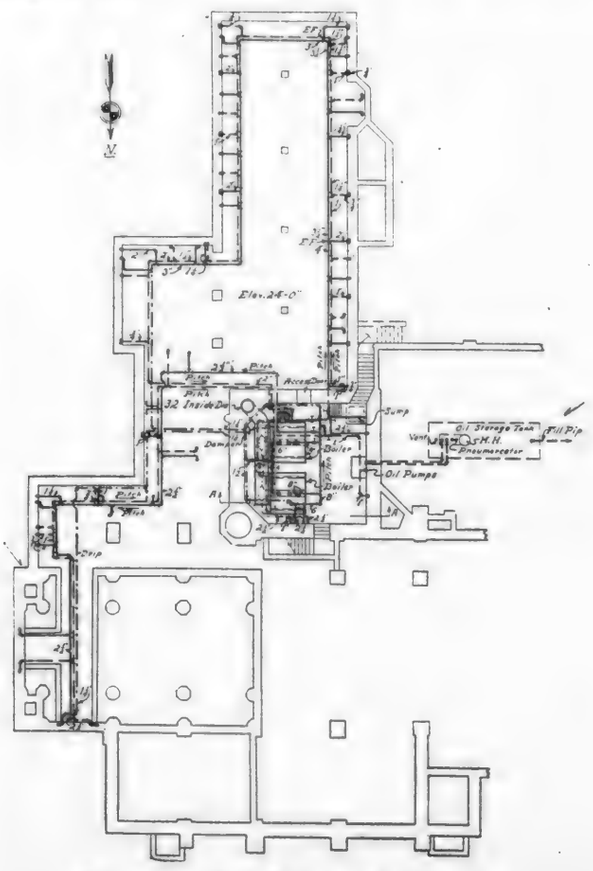


Fig. 12. Cellar Plan of Christ Church, Cranbrook, Mich.

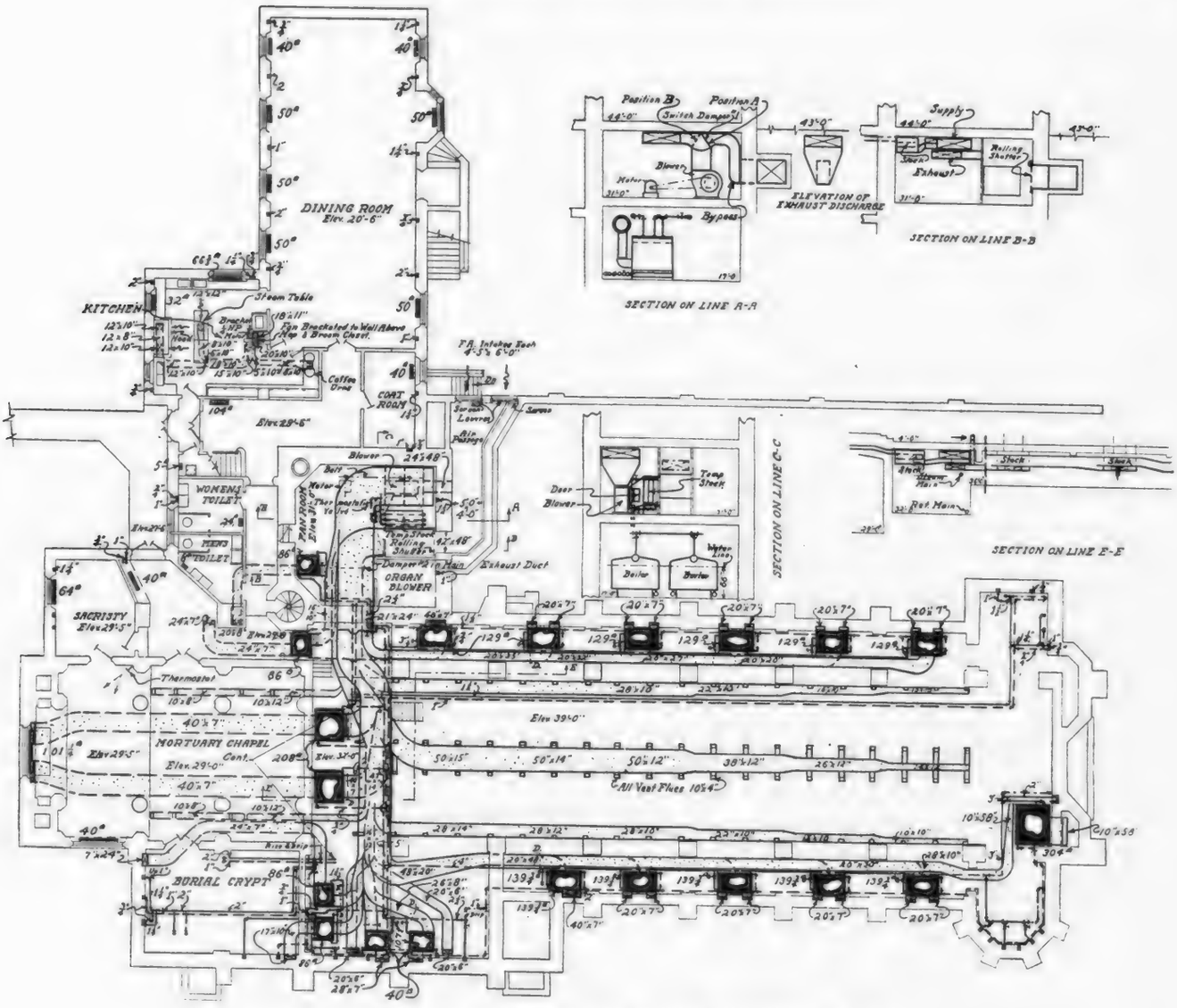


Fig. 13. Basement Plan of Christ Church, Cranbrook, Mich.

CHRIST CHURCH, CRANBROOK, MICHIGAN

Figs. 12, 13, 14 and 15, show the cellar, basement, first, second, and clerestory plans of Christ Church, Cranbrook, Michigan. The nave, chancel, and sanctuary are heated by warm air, the remainder of the building having a modulation steam heating system.

The boiler room is located in the tower portion of the building, below the level of the mortuary chapel and the basement of the social and Sunday school wing, these being the lowest occupied portions of the building. The distributing steam and return mains, for this portion of the building, are located in partly-excavated spaces under same, permitting these rooms to be heated by radiation standing on the floor.

There are two heating boilers, each boiler being of such size and capacity to take care of two-thirds of the total heating load. In case of a breakdown, one of the boilers can be forced to take care of the entire building. Oil is the fuel being used, the grade being 28 deg. to 31 deg. Baume, which is about the heaviest oil that can be burned without preheating. The chimney is in one corner of the tower and is carried to the top of same.

The roof over the chapel is so shaped that in the winter time the snow will bank against the adjacent large clerestory windows, partly blocking these. In order to prevent this, and possible leakage of water through these clerestory windows, a coil is placed under this roof to melt the snow, the steam supply to this coil being controlled in the cellar.

EXAMPLE OF WARM-AIR HEATING

As already stated, the church proper is heated by warm air. The air is taken in through two louvred and screened openings, but is not filtered. As the building is located in the country, it was decided that air filters were not necessary. The air for the organ chamber is taken in at the same place, but is separated from the masonry duct supplying the heating and ventilating system.

The fan room is located in the tower portion of the building, on the next level over the boiler room, the level of the fan room floor being 13 ft. below

the level of the floor of the nave. The air is tempered in the usual manner before passing through the fan.

There are no rooms under the nave proper, a partly excavated space being provided for the distributing mains and ducts of the heating and ventilating system. There is 6 ft. clear head room under the side aisles and 3 ft. 8 in. under the deep concrete girders located under the center portion and carrying the nave floor above. The span at this point is 30 ft.

Tempered air is conveyed through galvanized-iron ducts, located in the spaces under the north and south aisles. The air then passes through indirect or reheater stacks, where it is brought up to the proper temperature required for heating. Each reheater stack has two flues leading from same. These are located in the side walls, offset in ceiling over aisles and discharge through slots located in the sills of the large clerestory church windows. These discharge points are approximately 21 ft. above the nave floor. Each bay has its independent reheater stack.

Exhaust air is taken out through the pew ends and conveyed back to the fan room.

A typical heating and ventilating arrangement for each bay of nave is shown by Fig. 17. The arrangement for the heating and ventilating of the sanctuary and chancel is similar to this arrangement.

METHOD OF CALCULATING AIR TEMPERATURES AND VOLUMES

The width of the church at the nave is 45 ft.; and at the chapel 56 ft., the total length being 175 ft. The total height from the floor of the nave to the underside of the peaked roof is 60 ft.

The seating capacity of the church is 800 persons, of which 685 are in the nave, 50 in the chancel and 65 in the chapel off the nave.

Supply ventilation is based on 20 cu. ft. of air per minute per person, making a total of 16,000 cu. ft. per minute. The exhaust ventilation was taken as three-quarters of the supply, or 15 cu. ft. per minute per person, the total being 12,000 cu. ft. per minute.

Fig. 16

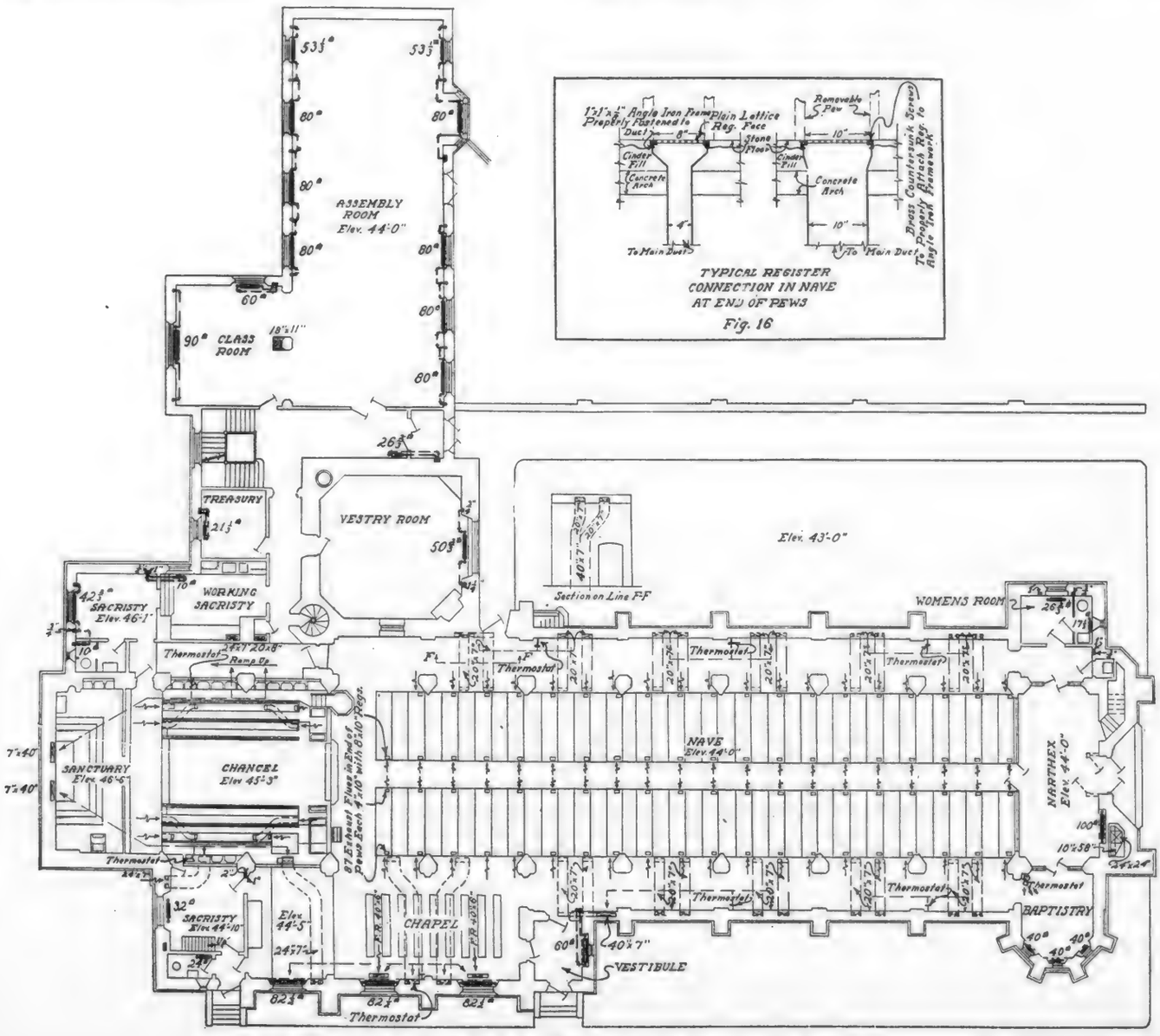


Fig. 14. First Floor Plan of Christ Church, Cranbrook, Mich.

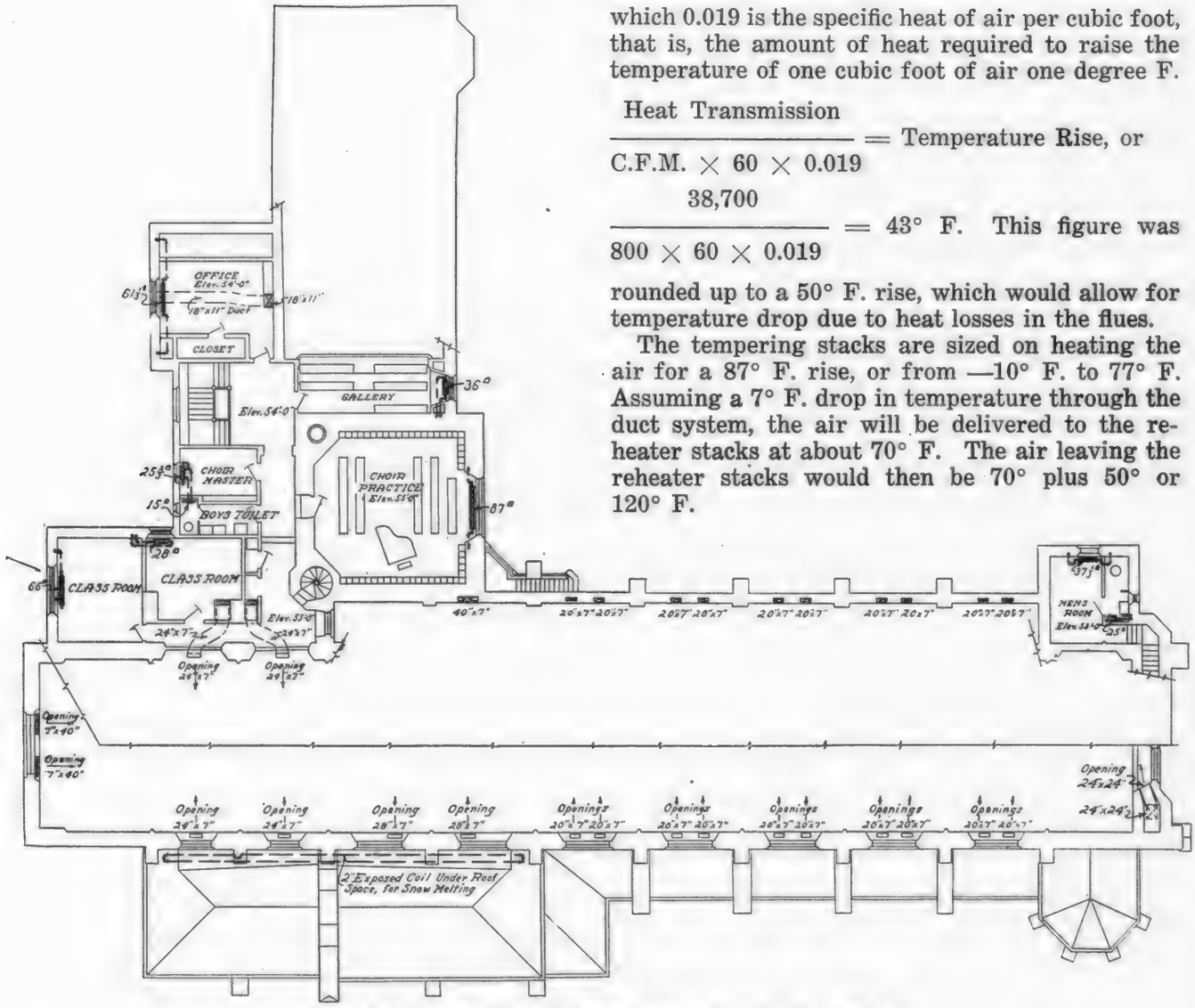


Fig. 15. Second Story Plan of Christ Church, Cranbrook, Mich.

The amount of air supplied to each portion of the church was determined by proportion, that is the ratio of the heat transmission of that part of the building to the total heat transmission times the total air supplied. For example, the amount of air to be supplied to one of the north bays (the part between two piers) was calculated to be 800 cu. ft. per minute. This was found in the following manner. The total heat loss for the church proper was calculated to be 766,500 B.T.U. The heat transmission for one north bay was 38,700 B.T.U. The total air supply, as already stated was 16,000 cu. ft. per minute. The air to be supplied to one north bay would then be:

$$\frac{\text{B.T.U. per bay}}{\text{Total B.T.U.}} \times \text{Total Air Quantity or}$$

$$\frac{38{,}700}{766{,}500} \times 16{,}000 = 800 \text{ C.F.M.}$$

The temperature up to which the air should be heated, as required by the heating requirements can be calculated from the following formula, in which 0.019 is the specific heat of air per cubic foot, that is, the amount of heat required to raise the temperature of one cubic foot of air one degree F.

$$\frac{\text{Heat Transmission}}{\text{C.F.M.} \times 60 \times 0.019} = \text{Temperature Rise, or}$$

$$\frac{38{,}700}{800 \times 60 \times 0.019} = 43^\circ \text{ F.}$$

This figure was rounded up to a 50° F. rise, which would allow for temperature drop due to heat losses in the flues.

The tempering stacks are sized on heating the air for a 87° F. rise, or from —10° F. to 77° F. Assuming a 7° F. drop in temperature through the duct system, the air will be delivered to the reheater stacks at about 70° F. The air leaving the reheater stacks would then be 70° plus 50° or 120° F.

The height available for circulating the air under gravity, that is the distance between the mean level of heating (middle of stack) to the mean level of cooling, was found to be 40 ft. At this height, and with a 50° difference in temperature between the air in the room and the heated air delivered (120°–70°), would give through the flues a velocity of nearly 400 ft. per minute. The amount of air to be supplied to each bay divided by this velocity would give the flue area, or

$$\frac{800}{400} = 2.0 \text{ sq. ft.} = 288 \text{ sq. in.}$$

There are two flues each 7 in. × 20 in. or a total of 280 sq. in.

Care must be taken in selecting the mean level of cooling, as it is only the center of the church when the heat transmission is uniform. With large windows in the upper portion of the church and small heat losses through the lower portion, this mean level would be well above the center of the building.

It will be found when the fan is not in operation and the church is not in use, that the natural cir-

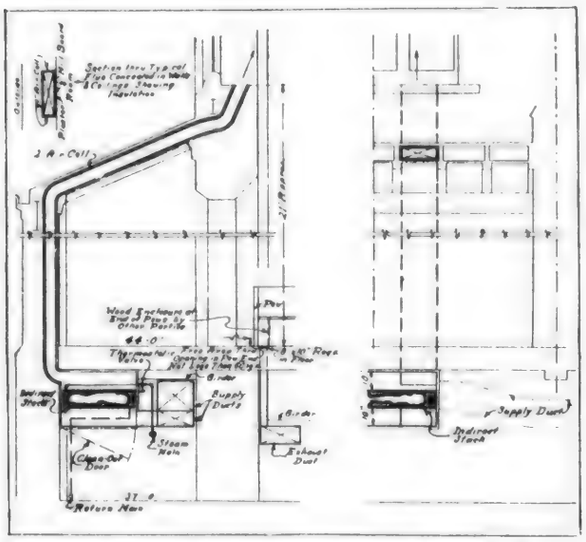


Fig. 17. Typical Bay in Christ Church, Showing Scheme of Heating and Ventilation

culation of air through the reheater stacks will give sufficient heat to temper the church. It was for this purpose that the discharge ducts from the stacks were figured on a gravity basis. To increase the amount of air, the clean-out doors provided under each reheater stack can be opened.

ONE FAN FOR BOTH SUPPLY AND EXHAUST

The arrangement of the fan room is unique in so far as one fan is used for both the supply and exhaust. Referring to one of the sections on Fig. 13, when the air is being recirculated, switch damper No. 1 would be in position "A", damper No. 2 in main exhaust duct would be open and the rolling shutter would be closed. If it is desired to supplement the air being exhausted by fresh air, the rolling shutter is partly opened. This would be the arrangement for normal heating operation.

As previously stated, since the exhaust system is laid out to handle three-quarters of the total supply, one-quarter of fresh air can be added in extreme weather without lowering the air temperatures for which the system was designed. As the weather becomes warmer more fresh outdoor air can be used.

If it is desired to supply air only to the church, as in the summer time, damper No. 2 is closed and the rolling shutter opened. The church would then be under pressure, the air escaping through openings in the building. Or if it is desired to exhaust the air only, damper No. 2 would be opened, switch damper No. 1 put in position "B" and the rolling shutter closed. Under these conditions, the fan would act as an exhauster, drawing the air through the tempering stacks, which of course would have no heat on, and discharging the air through the by-pass connection into the fresh air duct, which in this case would act as the air discharge duct.

By referring to Fig. 17, it will be noted that the register faces are not in the pew end openings but are at the floor level, in the duct connecting to the air spaces under the pew ends. It is desired, at times when there are pageants or processionals, to shift and turn the pews so that they will face the center aisle. This arrangement of registers permits the removing of the pews without interfering with the use of the floor or with the exhaust ventilation. Fig. 16 shows detail arrangement of these register faces. (See illustration on Page 72.)

In addition to the switch damper and damper on exhaust duct already described, each reheater stack connection is provided with a damper. These dampers have quadrants and set screws so that they can be set in any position.

HEAT REGULATION PROVIDED

The two inner rows of the tempering stack are automatically controlled in the usual manner by a thermostat located in the air supply duct. This thermostat is set at about 77° F.

The steam control to each reheater stack is automatically controlled by thermostats located in various parts of the church as indicated on Fig. 14 These thermostats are set for 70° F. or whatever temperature is desired.

The radiators in the principal rooms, such as chapel, baptistry, and mortuary chapel, are also under automatic heat control.

In the concluding article, Mr. Offner will describe ventilating systems as applied to church work.

Bertram Grosvenor Goodhue Associates, Architects
Offner & McKnight, Consulting Engineers
Nave, Looking Towards Choir, Christ Church, Cranbrook, Mich.

This is the twenty-second lesson of The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 22

By Ara Marcus Daniels

THE effect of pipe fittings, valves, etc., upon steam flow was covered in Lesson 18. Friction due to pipes, valves, etc., causes a loss of pressure between the boiler and points along the line. Therefore, as the steam travels away from the boiler, its pressure becomes less than at the boiler.

The point of lowest pressure in the main is at the end. The return main connects this point of lowest pressure directly with the boiler and, since water transmits pressure equally and undiminished in all directions, the pressure in the return main at this far point from the boiler will be the same as that in the boiler.

The velocity of flow of the water in the return main is relatively low since its volume is only one seventeen-hundredth of the volume of the steam from which it is condensed. Since the steam pressure at the end and at points along the steam main is lower than at the boiler, the water in the return main at the end where it is connected with the steam main, will rise to the level or height above the boiler water line so as to establish a static head equal to the pressure difference between that in the boiler and that at the end of the main or at the point in question.

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SMALL MAINS THE CAUSE OF FLOODING

Where the system has been poorly designed, the difference in pressure between these two points may be sufficient to cause a flooding of the steam main at the far end. This is most likely to be the case where small mains are used with consequent excessive drop in pressure, requiring that the boiler be set in a pit in order to assure proper allowance for the elevations of the water at different points.

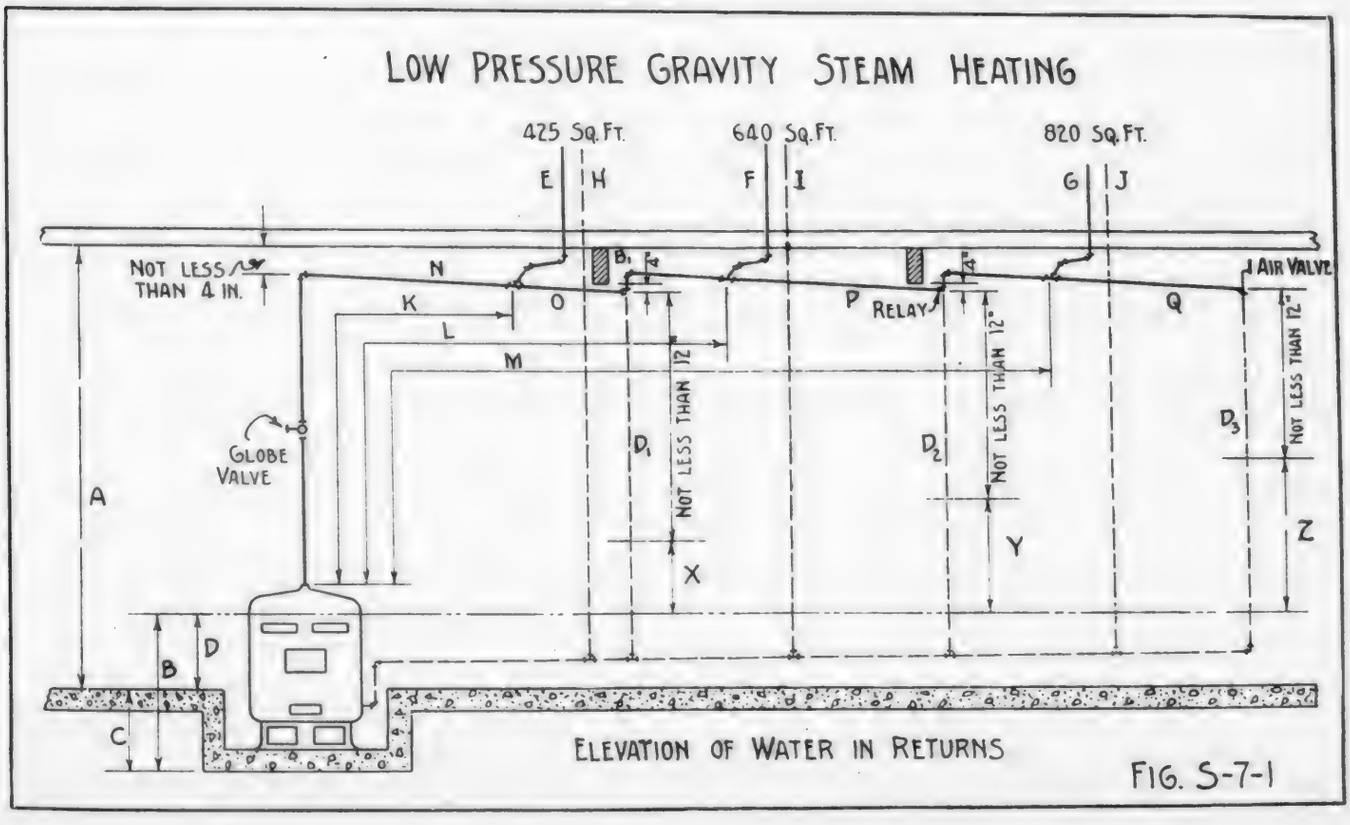


FIG. S-7-1

Greater depths are at times demanded so as to provide for non-uniform grades for the mains and to avoid beams or girders.

Fig. S-7-1 shows a typical low-pressure wet-return gravity steam layout where relays are required. The use of these "step-ups" necessitates the use of extra fittings. These extra fittings increase the resistance to steam flow and consequently add to the pressure loss in the system. Each relay should be drained as shown in Fig. S-7-1 or as per Fig. S-7-2.

The elevations of the water above boiler water line in the three drips designated as D_1, D_2, D_3, Fig. S-7-1, are indicated by the letters X, Y, and Z. It should be observed that these heights differ, the greatest being in the drip farthest from the boiler.

In practice, it is advisable to consider carefully all problems of steam distribution in which conditions similar to these illustrated in Fig. S-7-1 are met.

DETERMINING THE DEPTH OF BOILER PIT

The following solution and explanation should enable the student to investigate properly and determine when a boiler pit is required and, if required, the depth of such. Reference to Fig. S-7-1 will identify the following notations and data.

A = basement floor to ceiling = 7 ft. 6 in.
B = height of boiler waterline = 60¾ in.
C = to be determined.
D = height of boiler waterline above floor = (B-C).
E = riser to point where 425 sq. ft. radiation is taken off = 2 in.
F = riser to point where 640 sq. ft. radiation is taken off = 2½ in.
G = riser to point where 820 sq. ft. radiation is taken off = 2½ in.
H = return from 425 sq. ft. radiation = 1½ in.
I = return from 640 sq. ft. radiation = 2 in.
J = return from 820 sq. ft. radiation = 2 in.
K = actual length to first take-off = 60 ft.
L = actual length to second take-off = 125 ft.
M = actual length to third take-off = 250 ft.
N = size of main to first take-off (to be determined).
O = size of main to second take-off (to be determined).
P = size of main to drop take-off (to be determined).
Q = size of main to drop (to be determined).
X = elevation of water in first drip connection (to be determined).
Y = elevation of water in second drip connection (to be determined).
Z = elevation of water at end of run drip (to be determined).
Steam pressure at boiler = 5.3 lbs. gage.
B_1 = 18 inches.

The first step is to establish the size of pipe N. Steam to supply all radiation flows through this section.

The total radiation is equal to 1885 sq. ft. On the basis of an assumed pressure loss of 1.5 oz. per 100 ft. pipe to this first take-off, by Table S-3-2, the size of pipe N will be 4-in. If a slightly greater loss be allowed, a 3½-in. pipe may be used. For the demonstration of the principle here embodied this size will be selected.

The equivalent length of run from the boiler to the first take-off should be checked as follows:

Actual length, K	= 60 ft.
Equivalent lengths	
Boiler outlet (consider equal to one globe valve)	= 39 ft.
Globe valve in line	= 39 ft.
One elbow	= 12 ft.
One tee	= 31 ft.
Total equivalent length	= 181 ft.

If it be assumed that each square foot of radiation will condense 0.25 lbs. of steam per hour (the actual condensation depends upon the kind of radiating surface) and on this basis estimate the quantity of steam flowing per minute, the value obtained is

0.25 (lbs.) × 1885 (sq. ft.) ÷ 60 (min.) = 7.8 lbs. per min.

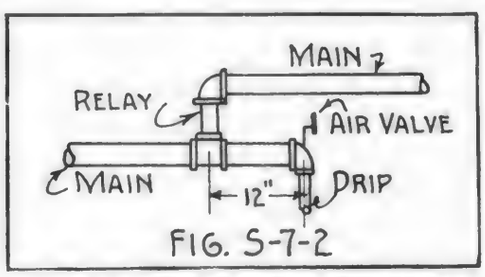


Fig. S-7-2. Method of Draining Relay

The pressure drop from boiler to first take-off for the conditions stated, as may be computed by the form outlined in Lesson S-2, is 0.086 lbs. when 7.8 lbs. of steam is flowing per minute, with an initial pressure of 5.3 lbs. per sq. in. at the boiler. The pressure at the first take-off, or foot of riser E, will then be

5.3 — 0.086 = 5.214 lbs. per square inch gage.

A similar procedure is carried through for section O, Fig. S-7-1, of steam main. This section must supply steam for 1460 sq. ft. of radiation. By Table S-3-2, and allowing a slightly greater pressure drop than in section N, a 3-in. pipe may be selected as suitable. The equivalent length of this run will be as follows:

Actual length = L — K; 125 ft. — 60 ft. = 65 ft.
Equivalent lengths

2—standard elbows (90°)	= 20 ft.
1—tee	= 26 ft.
Total equivalent length (between first and second take-off)	111 ft.

The quantity of steam to be supplied per minute through this section will be 0.25 (lbs.) × 1460 (sq. ft.) ÷ 60 (min.) = 6.1 lbs. The pressure drop between the two ends of this section O will then be (calculated as explained in Lesson S-2) 0.089 lbs.

(*Continued on Page* 79)

PIPECRAFT

HOW often in heating and ventilating specifications is it stated that, "the work shall be done in a first-class, workmanlike manner"? And how often is the job carried out in a "workmanlike" manner? To what does this phrase particularly refer—the radiators, the boilers, or what? Of course, the whole job must be workmanlike, but this wording is intended to apply especially to the piping. For, by no other means can a good job or a poor job be so quickly distinguished as by the piping and its method of installation.

Any contractor can purchase a standard make of radiator, a dependable boiler or a good class of radiator valve, but he cannot purchase a "workmanlike" piping job. This can only be obtained by constant and careful supervision, backed with a well-grounded knowledge of what good piping really is. A contractor with the best intentions in the world cannot deliver the goods to the satisfaction of the engineer and architect unless he is thoroughly grounded in the rudiments of standard piping practice, nor can the engineer or architect make intelligent demands on the contractor in interpreting the "workmanlike" clause unless he, too, is familiar with what is regarded as the best piping practice.

The purpose of this and subsequent papers is to bring out the points which are essential to good piping design, as well as to point out various items to be avoided in order to escape justifiable censure.

FIRST and foremost, all risers must be erected in positions carefully selected in accordance with the plans, to clear finished construction as shown on the details and, needless to say, *should be plumb and true.* To insure this, all pipe should be examined before erection to see that the pipe itself is straight and true, as frequently the pieces become slightly bent or bowed, either in shipment or in subsequent handling. Such deformed lengths must be straightened before erection, as a true and plumb job cannot be produced with bent pipe regardless of how perfect the work may be in all other respects.

Reaming of Pipe

One of the first things a steamfitter has to learn is carefully to ream out the ends of all pipe to avoid having the area of the line reduced by the burrs left by the pipe cutter. Such burrs also increase the friction to a considerable extent on account of the rough interior projections, causing obstructions to the free passage of steam and water. On a water heating job this interference is even more serious in its results, often causing the flow to be cut down in certain portions of the piping and resulting in uneven circulation.

Fig. 1 shows the pipe as left by the ordinary pipe cutter and Fig. 2 the appearance of the same pipe after being properly reamed.

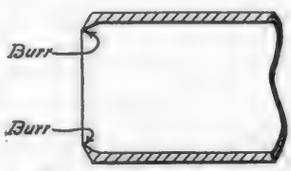


Fig. 1. Section Showing End of Pipe When Cut With Ordinary Pipe Cutter

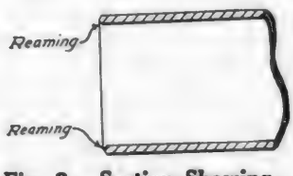


Fig. 2. Section Showing End of Pipe After Being Reamed Out

Location of Runout Tees

Great care must be taken in locating the levels of the tees in the risers, as a mistake on this part of the work sometimes necessitates taking down of the entire riser to rectify the error, a costly and quite needless expense which can be avoided by care in the first place.

The sizes of the branch outlets on the tees in the risers also must be checked, for a tee of too large a size branch must be bushed down (look out for a prohibition against the use of bushings in the specifications) and a tee with too small an outlet will require a tearing down of the riser and its re-erection with the proper sized fitting when the error is discovered later.

Taking Care of Expansion

Expansion of the risers must be provided for, especially in buildings over four or five stories in height. There are several ways to take care of this and the best method is often only determinable in the individual case by the local conditions, in the particular installation involved. Space conditions, method of building construction, column arrangement, height of window sills, all have to be taken into account in order to find the most feasible manner to meet this demand.

While expansion joints are sometimes used on risers, it may be said in general that they are unsightly, introduce a possibility of leaks, and are not usually considered to be the most satisfactory solution of the riser expansion problems.

Swing Joints

Probably the most

popular scheme of taking care of riser expansion is the swing joint. This has been in use in varying

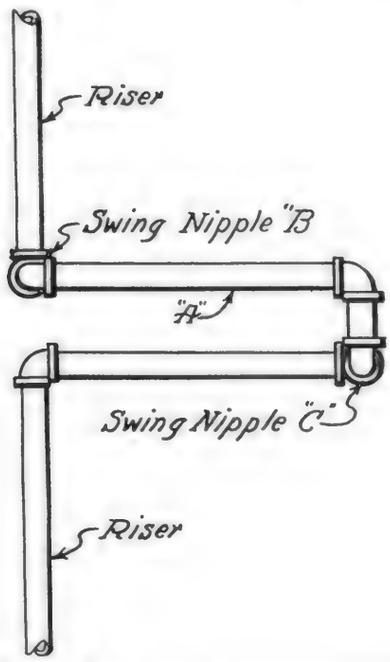


Fig. 3. Typical Swing Joint to Accommodate Expansion

forms for a long period of years and seems to give excellent satisfaction when properly installed. The basic principle of the swing joint is to provide a piece of pipe in the riser between the top and bottom portion so connected that it will form a swinging section of line turning on nipples to accommodate the up and down movement of the ends of the riser.

Such swing joints can be arranged in a variety of ways to suit the prevailing structural conditions. A typical example of such a joint is shown in Fig. 3. In this case the piece "A" swings on the two swing nipples at "B" and "C" located at the ends of the riser.

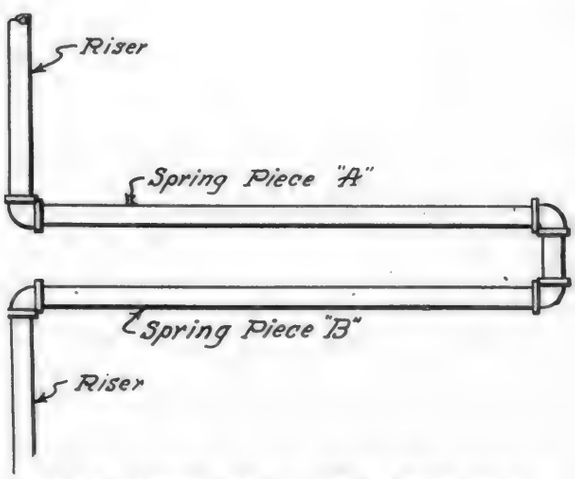


Fig. 4. Example of "U" Offset Often Used to Take Up Expansion

The U Bend

Another method often used, when the amount of expansion to be taken up is small, is the offset

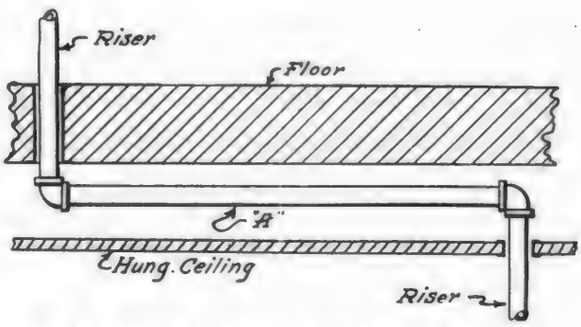


Fig. 5. Use of Offset to Take Care of Expansion

or "U" in which the movement of the riser is taken up in the spring of the arms. An example of this is shown in Fig. 4 where the spring pieces "A" and "B" move up and down with the expansion and contraction of the riser, but it can be easily seen that these spring pieces must be of considerable length to accommodate movement of any magnitude. A short leg would not have the necessary spring and something would have to give as soon as the riser movement became pronounced. The required length of these legs, and the space necessary to receive them without interfering with other details of construction, is the chief objection to this type of expansion arrangement.

Offsetting Pipes

A similar scheme except in form of an offset instead of a complete U is often a much more feasible solution. In this case the risers are simply offset at one floor to give a sufficient length of horizontal run to supply the necessary spring piece. An example of such an offset is shown in Fig. 5 where the riser is offset through the horizontal portion "A" so as to provide ample length to take up movement originating in the vertical lines. It does not make any difference in what direction the offset is made so long as it is a horizontal run made with 90 deg. fittings at both ends.

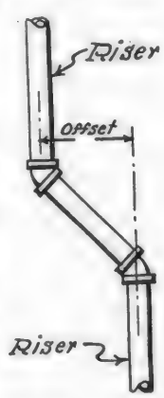


Fig. 6. Example of a 45° Offset Which is Useless to Absorb Expansion

A little knowledge is often a dangerous thing and sometimes the mechanic on the job has a dim idea that, if an offset will provide for expansion, any kind of an offset will serve. Proceeding along this line of reasoning he calmly puts in a 45 deg. offset and is sure he has done everything that any reasonable person could expect. As a matter of fact, it has been proven that a 45 deg. offset in a riser (such as is shown in Fig. 6) is absolutely valueless for absorbing expansion. Therefore a riser may be made up with such 45 deg. offsets occurring at every floor and still require special provision of expansion in some of the regular ways described for this purpose.

Pipe Bends

The last way of providing for expansion in risers consists of the pipe bend scheme such as illustrated in Fig. 7. This solution requires even more room than the U offset, shown in Fig. 4, and, therefore,

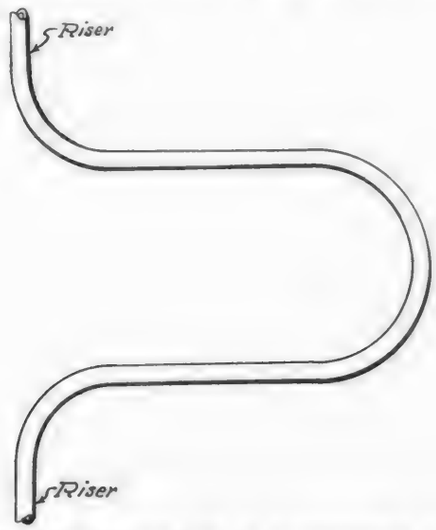


Fig. 7. U-Bend Often Used to Accommodate Excessive Expansion

is little used except in pipe-shafts or behind furring where plenty of vertical space is available.

The next section of the series will cover the amount of expansion obtained in risers and the proper points and methods of support so as to care for such expansion.

Home Study Course in Gravity Steam and Water Heating

(*Continued from Page 76*)

The pressure at foot of riser F will therefore be 5.214 — 0.089 = 5.125 lbs. per sq. in. gage.

Similar procedure for section P is carried through as follows:

This section must supply steam for 820 sq. ft. By Table S-3-2, a 2½ in. pipe may be selected. The equivalent length of this run will be:

Actual length = M — N;	
250 ft. — 125 ft.	= 125 ft.
Equivalent lengths	
2—standard elbows (90°)	= 14 ft.
1—tee	= 20 ft.
Total equivalent length (between second and third take-off)	159 ft.

The quantity of steam to be supplied per minute through this section will be

0.25 (lbs.) × 820 (sq. ft.) ÷ 60 = 3.42 lbs.

The pressure drop between the two ends of this section P will then be (calculated as explained in Lesson S-2) 0.085 lbs.

The pressure at foot of riser G will then be

5.125 — 0.085 = 5.040 lbs. per sq. in. gage.

A cubic foot of water at 212° F. weighs 59.76 lbs. A column of water having an area of 1 sq. in. and height of 1 ft. will weigh 59.76 ÷ 144 = 0.415 lbs. The head in inches equivalent to 1 lb. pressure will be 1 ÷ 0.415 × 12 (in.) = 28.92 in.

Thus the heads of water required at X, Y, and Z to offset the pressure loss in the main up to where the risers E, F and G are taken off will be:

At X, 0.089 (lbs.) × 28.92 (in.) = 2.57 in. head.
Y, (0.089 + 0.085) × 28.92 (in.) = 5.02 in. head.
Z, (0.089 + 0.085 + 0.085) × 28.92 (in.) = 7.48 in. head.

DEPTH OF PIT

With the necessary data at hand, calculations to determine depth of pit, if needed, may be made. In so doing, it should be borne in mind that the depth must not only provide for the maximum elevation of water in the drops, but also for the clearance required to pass beams, the pitch demanded to maintain proper grade plus all other clearances that may be required. Separate tabulations will be made for each of the points since any one of them may govern.

Conditions at X	
Beam = B_1	= 18 in.
To center of tee	= 4 in.
Minimum allowance	= 12 in.
Elevation (X)	= 2.57 in.
Water line	= 60.75 in.
Total	= 97.32 in.
Height of Basement	= 90.00 in.
Depth pit C	= 7.32 in.
Conditions at Y	
Beam = B_1	= 18 in.
To center of tee	= 4 in.
Minimum allowance	= 12 in.
Elevation (Y)	= 5.02 in.
Water line	= 60.75 in.
Total	= 99.77 in.
Height of Basement	= 90.00 in.
Depth of pit C	= 9.77 in.
Conditions at Z	
Clearance of relay	= 4 in.
Grade of pipe	= 2 in.
Minimum allowance	= 12 in.
Elevation (Z)	= 7.48 in.
Water line	= 60.75 in.
Total	= 86.23 in.
Height of Basement	= 90.00 in.

Hence, so far as conditions at Z are concerned, no pit is necessary. The boiler could be set on the basement floor. The governing condition is at Y, calculations indicating that the boiler must be set at least 10 inches below the basement floor. A pit 12 inches deep should be specified.

Work Problems S-7-1, S-7-2, S-7-3

(*To be continued*)

Refrigeration as Applied to Air Conditioning

Australian Practice as Compared to Usual American Methods with Hygrometric Chart from American and Indian Sources

By A. Lewis

Chief mechanical engineer, Commonwealth Works Department, Melbourne, Australia.

COOLING of building interiors, as practiced in Australia, is described in an interesting way, in a paper by A. Lewis, chief mechanical engineer of the Commonwealth Works Department, which was presented recently before the Victorian Institute of Refrigeration.

"In Melbourne," states Mr. Lewis, "we are faced with a temperature range of from 27° to 111° F. and relative humidity from 20% to 100%. With tap water approximating 72° F. in summer and 45° to 50° F. in winter and with no prospect of obtaining colder water from underground sources, we can only look for air cooling by water evaporation at limited periods of high temperature and low humidity."

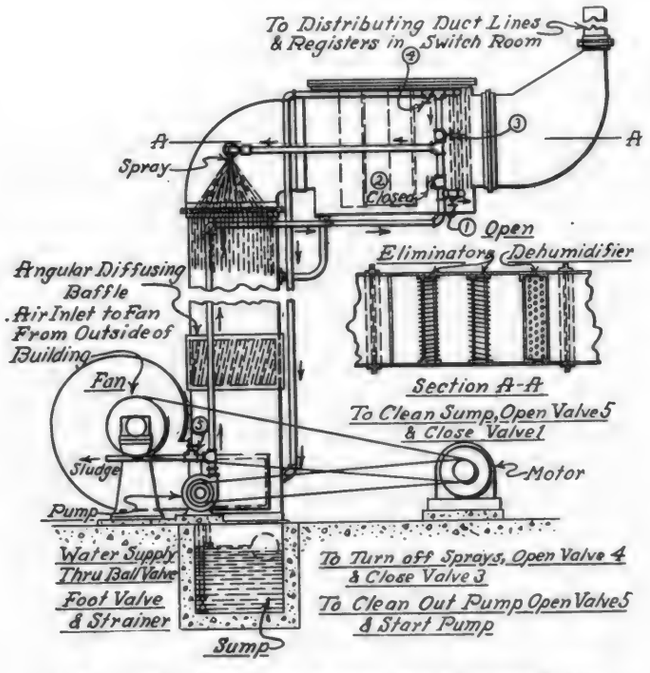


Fig. 1. A Typical Air Washing and Heating Plant

For automatic telephone exchanges, it is stipulated that the relative humidity shall not exceed 70% and that the air shall be clean. With a view to economy in installation and operating costs, attempts were made to obtain these conditions by means of air washing and heating. The buildings were constructed to minimize the chances of untreated dust-laden air entering the switch room.

Under normal working conditions in automatic exchanges, about 8000 cu. ft. of air space is available for each employee. This was considered large enough to warrant not more than one change of air per hour and that was the provision made for the first exchanges equipped with ventilating plants, including air washers. The heating was by direct water radiation. Provision was also made for vacuum cleaning and for compressed air dusting.

EXAMPLE OF AIR CONDITIONING SYSTEM FOR TELEPHONE EXCHANGE

Fig. 1 is a typical arrangement of a plant designed to meet these conditions, air being drawn through a centrifugal fan and passed through an enlarged section of ductwork provided with diaphragms arranged to divide the air into narrow

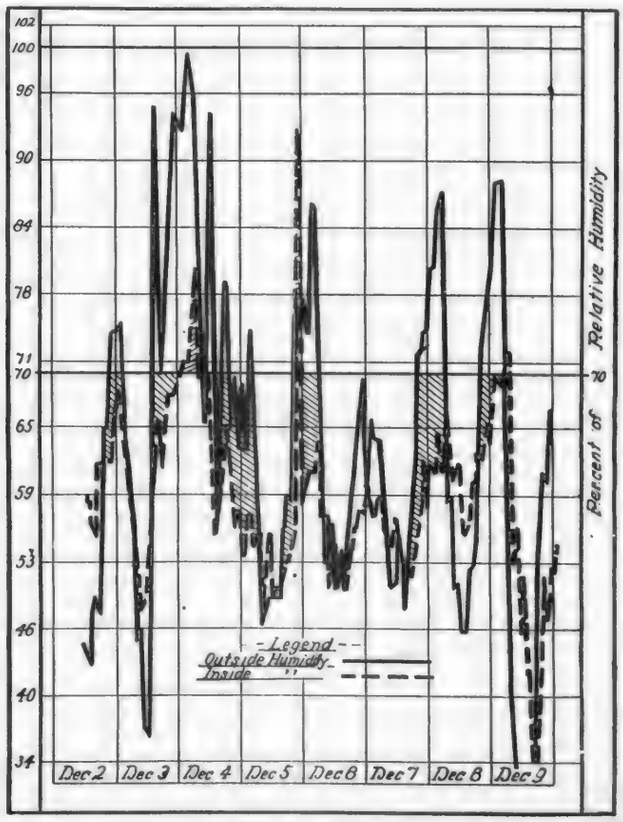


Fig. 2. Humidity Chart of Observations Taken at the Malvern (Vic.) Telephone Exchange

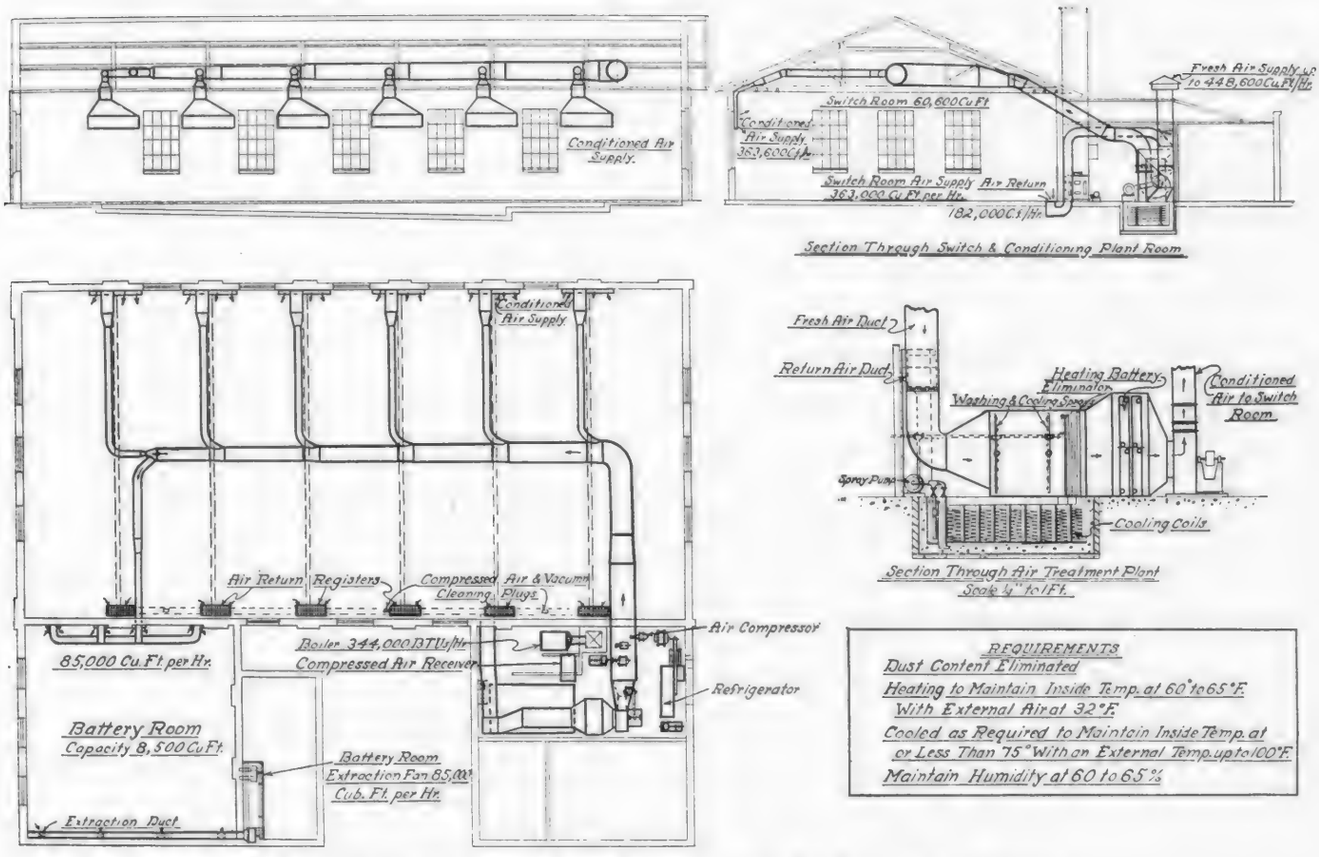

Conditioned Air Supply.
Switch Room 60,600 Cu Ft
Conditioned Air Supply 363,600 Cu Ft per Hr.
Switch Room Air Supply 363,000 Cu Ft per Hr.
Air Return 182,000 Cu Ft/Hr.
Fresh Air Supply up to 448,600 Cu Ft/Hr.
Section Through Switch & Conditioning Plant Room
Conditioned Air Supply
Air Return Registers
Compressed Air & Vacuum Cleaning Plugs
85,000 Cu Ft per Hr.
Boiler 344,000 BTUs/Hr
Compressed Air Receiver
Air Compressor
Refrigerator
Battery Room Capacity 8,500 Cu Ft
Battery Room Extraction Fan 85,000 Cub. Ft. per Hr.
Extraction Duct
Fresh Air Duct
Return Air Duct
Heating Battery
Eliminator
Washing & Cooling Sprays
Conditioned Air to Switch Room
Spray Pump
Cooling Coils
Section Through Air Treatment Plant
Scale ¼" to 1 Ft.
REQUIREMENTS
Dust Content Eliminated
Heating to Maintain Inside Temp. at 60° to 65° F. With External Air at 32° F.
Cooled as Required to Maintain Inside Temp. at or Less Than 75° With an External Temp. up to 100° F.
Maintain Humidity at 60 to 65%

Fig. 3. Collingwood Telephone Exchange. Air Conditioning and Cooling.

streams and deflecting the flow to make sure that the dust and heavy foreign particles in the air are carried by centrifugal force onto the surface of the deflectors which are continuously washed with spray water. The air is then passed through the water spray and through eliminating deflectors, which have their leaving edges turned to form catchers for water globules caught on the deflectors, and to prevent the water collected from being again picked up with the air.

A surface condenser for dehumidifying was also included. Tubular dehumidifiers were provided through which artificially-cooled water at a temperature below the required dewpoint could be circulated for reduction of moisture content by surface condensation.

Heating was effected by direct hot water radiation located about the walls of room, assisted, in some cases, by an auxiliary indirect heater located in the ductwork.

Generally, with this plant, the humidity could be maintained within the required limits at temperatures too high for comfort (Fig. 2), and experience gained indicated the necessity for more frequent changes of air and means for reducing the temperature.

The first plant in which mechanical refrigeration was applied by the Commonwealth Works Department was that for a manual telephone exchange in which improved working conditions were found necessary for staff comfort and efficiency. Here the building was occupied 24 hours daily throughout the year, which does not permit of freshening up the rooms during unoccupied periods, as is demanded of entertainment houses by municipal regulations.

The volume of the main switch room was 68,000 cu. ft. and the volume of the whole building 176,-180 cu. ft. Ventilation was provided for the whole building at variable rates up to 18,000 cu. ft. per minute.

AMMONIA COILS SUBMERGED TO INSURE SAFE OPERATION

When designing the plant, consideration was given to the general American air-conditioning practice, in which the use of Baudelot coils, such as are used in the surface cooling of liquors, is general. On account of the risk of carrying ammonia gas through to the switch rooms, it was decided to completely submerge the ammonia coils to eliminate any risk. In this regard such simple matters as the use of turps in paint inside telephone exchange buildings has caused trouble, oxidization on faulty switch contacts having been traced to turps.

The rated capacity of the refrigerator installed was 8 tons per 24 hours, or 1766 B.T.U. per minute. The spray water was circulated at the rate of 66 gal. per minute and the refrigerator was capable of cooling this water 2.66° F.

The refrigerator represented 1 ton per day refrigerating effect per 2260 cu. ft. of air per minute, and, while a measure of comfort was obtained, it was found that more liberal refrigeration effect

must be provided where control of atmospheric conditions is required.

A COMPARISON WITH AMERICAN PRACTICE

In an early American automatic telephone exchange air-conditioning plant, the circulating fan had a capacity of 5500 cu. ft. per minute, and 550 cu. ft. of external air was admitted to the system. A 6-ton refrigerator was provided, representing 1 ton per 1000 cu. ft. of air treated. Temperatures of 75° F. with R.H. 60% are obtained and are stated to be satisfactory. This condition represents a dewpoint of 60° F., and would require a spray temperature of approximately 50° F.

DESIGN OF PLANT FOR U. S. SENATE CHAMBER

For the U. S. Senate Chamber tenders were invited for a 35,000 C.F.M. ventilation plant, with a refrigerator capacity of 3,710,000 B.T.U. per hour, or 280 tons per 24 hours, or at the rate of 8 tons per 1000 cu. ft. Here the air was required to be cooled from a range of 85° F. and 85% humidity to 70° and 50% humidity, and down to 50° F. saturated, ready for reheating. The water content of air at 85° F. and 80% humidity is 1.92 lbs. per 1000 cu. ft., and the heat content above 0° F. is 3050 B.T.U. per 1000 cu. ft., and the dewpoint 75° F. Air at 70° and 50% R.H. contains 0.74 lbs. of water per 1000 cu. ft., and the total heat above 0° F. is 1800 B.T.U. per 1000 cu. ft. and the dewpoint, 50½° F. Air at 50° F. saturated contains 0.72 lbs. of water per 1000 cu. ft., and 1430 B.T.U. per 1000 cu. ft.

The cooling effect required for the 85° to 50° F. is 3050 — 1430 = 1620 B.T.U. per 1000 cu. ft., or 3,400,000 B.T.U. per hour, and the rated requirements apparently allowed 10% margin.

COST OF PROPOSED SENATE PLANT PROHIBITIVE

The tenders for this work approximated £70,000 (approximately $350,000), and the work was not proceeded with on account of the excessive cost. In this regard the air after being saturated and cooled to 50° F. would require to be heated to 70° F. for comfort. With no addition of moisture this air would have a R.H. of 51% and a total heat content of 1830 B.T.U. per 1000 cu. ft., or 2,560,000 B.T.U. per hour. Washing with spray water at 42° would give this condition at a saving of nearly 30% on the specified requirements. Even at this the 50% R.H. for human occupancy, in my opinion, is low, and a temperature of 70° F. with humidity up to 75% inside, while conditions of 85° and 85% R.H. are met outside, would provide more than adequate comfort at an expenditure of 1,575,000 B.T.U. per hour. This represents a reduction of over 50% in the specified requirements, and, with a dewpoint of 62°, would require a spray temperature of, say, 52°.

In the air conditioning of automatic telephone exchanges, provision is made to change the air six times per hour in the rooms to be conditioned.

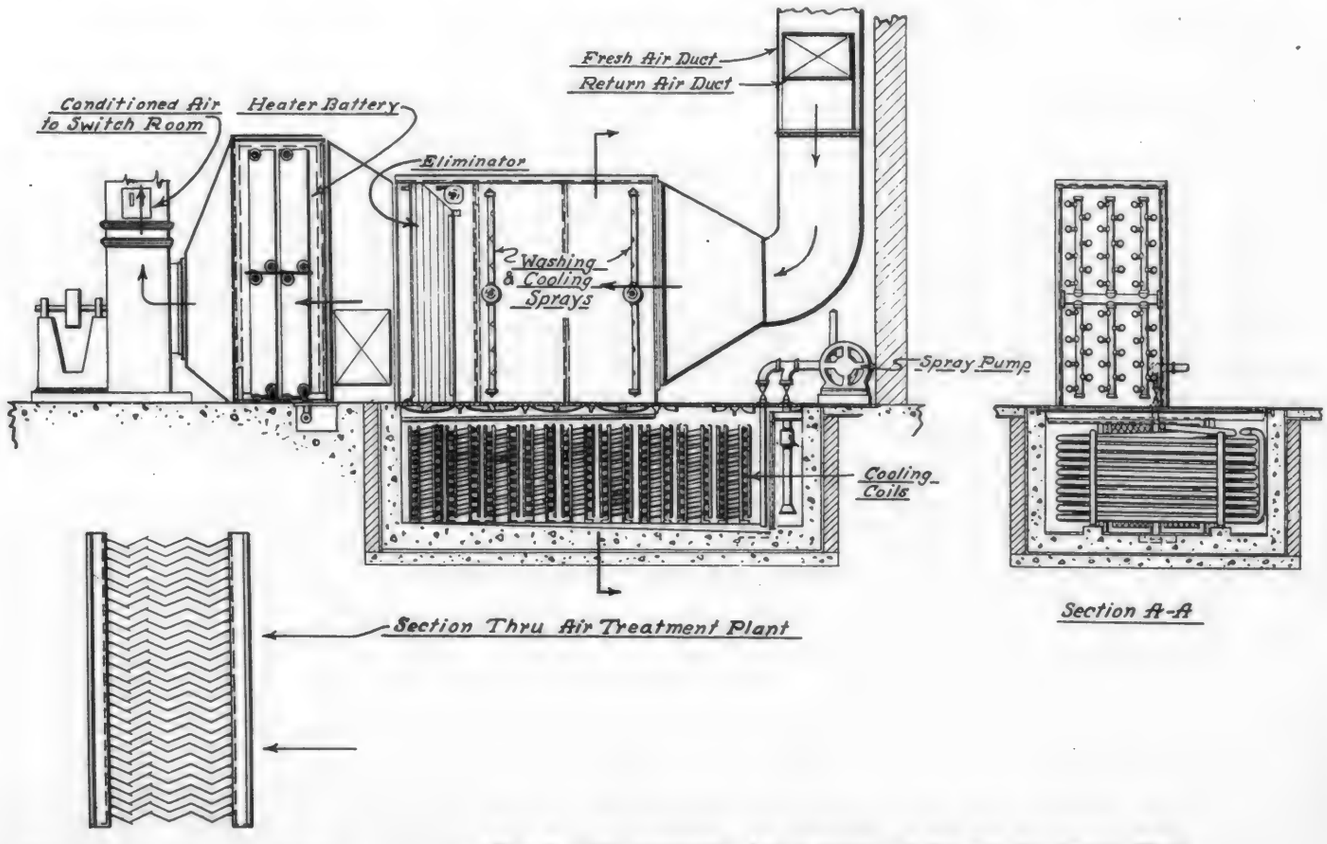


Fig. 4. Diagrammatic Arrangement of the Air Treatment Plant at the Collingwood (Vic.) Telephone Exchange

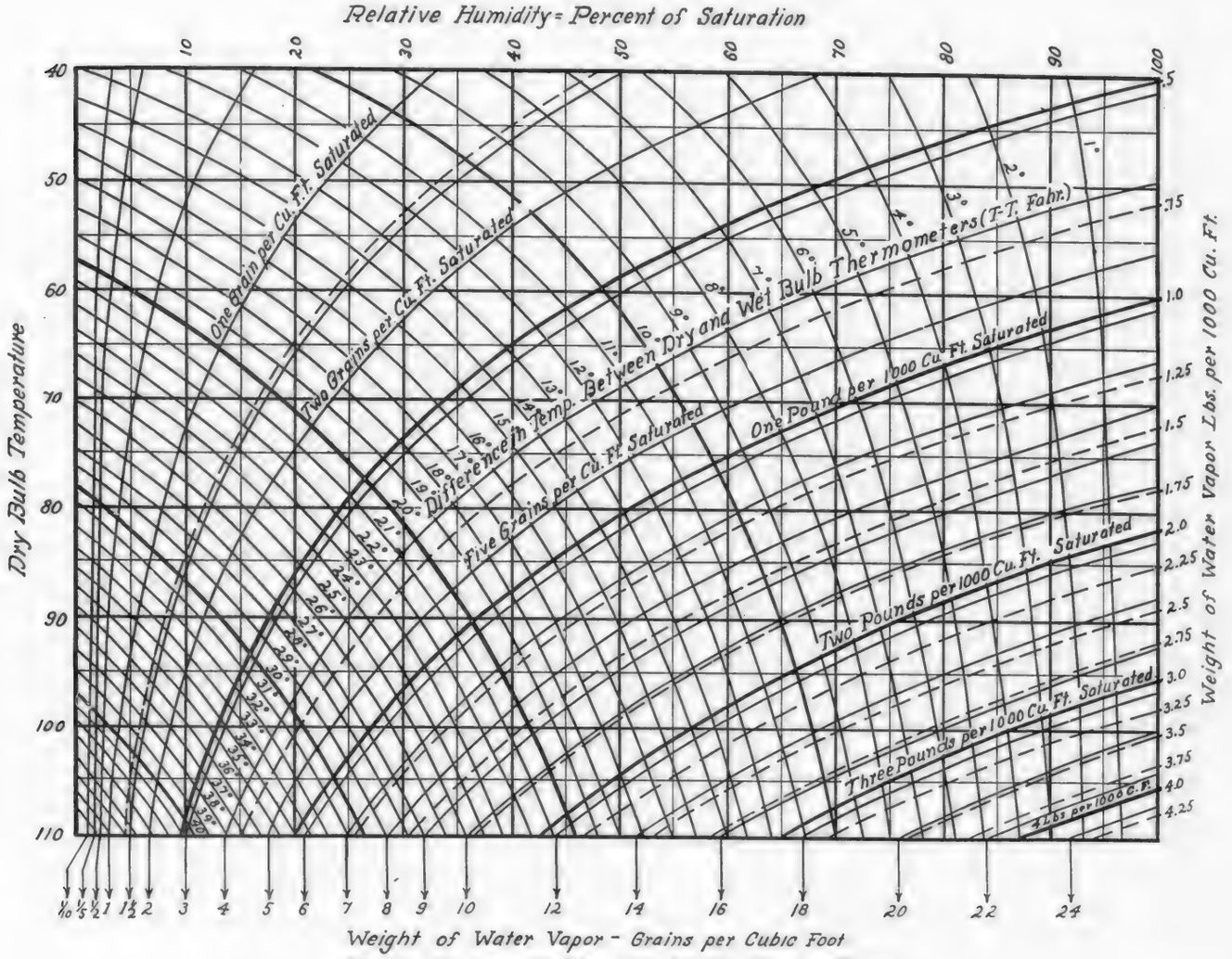

Relative Humidity = Percent of Saturation
Dry Bulb Temperature
Weight of Water Vapor - Grains per Cubic Foot
Weight of Water Vapor Lbs. per 1000 Cu. Ft.
One Grain per Cu. Ft. Saturated
Two Grains per Cu. Ft. Saturated
Five Grains per Cu. Ft. Saturated
Difference in Temp. Between Dry and Wet Bulb Thermometers (F. Fahr.)
One Pound per 1000 Cu. Ft. Saturated
Two Pounds per 1000 Cu. Ft. Saturated
Three Pounds per 1000 Cu. Ft. Saturated
4 Lbs. per 1000 C.F.

Fig. 6. Hygrometric Chart for Air Conditioning Plants

EQUIPMENT FOR COLLINGWOOD TELEPHONE EXCHANGE

The Collingwood plant and duct layout shown in Fig. 3 includes a centrifugal fan for obtaining the air from a suitable outside source and delivering the air through the treatment chamber and duct-work to a suitable location in the treated room, and was designed to meet the following requirements:—

(1) Dust content eliminated.
(2) Warmed as required to maintain the temperature inside the exchange at 60-65° F. with an external temperature of 32° F.
(3) Cooled as required to maintain temperature inside exchange at or less than 75° with an external temperature up to 100° F.
(4) Moisture content regulated to maintain humidity at or less than 70%.
(5) Constant motion of air in switch room with freedom from drafts.

The ducts have been liberally proportioned to reduce fan power and eliminate risk of noise, a limit velocity of 20 ft. per second in ducts being allowed. Registers are designed to limit discharge velocities to 1½ ft. per second. Provision is made for recirculating a portion of the air up to 50% of the volume treated.

(1) The air is washed to eliminate dust, etc., by passing through two banks of water sprays spaced at 5-in. and 4½-in. centres. When in operation these sprays form two fairly thick walls of finely-divided water particles in motion, one set being opposed to the air flow and one set assisting the air flow. The dust removed from the air is carried down with the water to the cooling tank, from which provision is made for sludging as required.

(2) The air is passed through Vento heater stacks, containing 62 sq. ft. of heating surface per 1000 cu. ft. of air. Hot water is circulated through

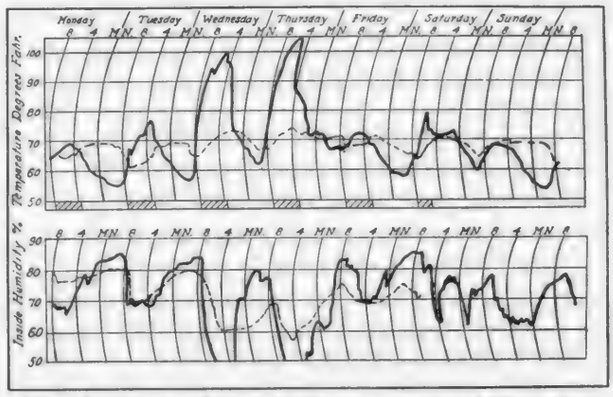


Fig. 5. Curve Showing Temperature and Humidity Variations at the Collingwood Telephone Exchange

the inside of the heaters by means of a centrifugal pump, and the surface temperature can be maintained between 80° F. and 200° F. as required. The heating battery has a maximum capacity of 46,000 B.T.U. per hour per 1000 cu. ft. per minute, and is capable of raising the air temperature through 40° F.

(3) The air is cooled by direct contact with the spray water which is recirculated in the system. It is forced through spray jets by means of a centrifugal pump having a capacity of 240 gal. per hour per 1000 cu. ft. per minute. On leaving the sprays the water falls to a cooling tank under the washer casing and passes over refrigerator coils to the pump suction pipe for recirculation to the sprays.

The cooling coils have a rated capacity of 14,300 B.T.U. per hour per 1000 cu. ft. of air per minute, and are capable of reducing the spray temperature 6° F., which, in turn, is capable of reducing the air temperature through 13° F., in addition to the normal evaporation cooling effect.

(4) The air is passed through moisture eliminators consisting of deflectors having the surface maintained wet by means of scrubbing sprays. Surplus water in the form of spray or suspended water carried through with the air is deposited on these wet deflectors (Fig. 4).

To maintain the relative humidity at 70% at comfortable temperatures, it is necessary at times to remove a portion of the water vapor content of the air. This surplus vapor is removed by condensation in direct contact with the spray water which is cooled to a practical limit below the required dewpoint or saturation temperature. The vapor condensed is combined with the cooling water and falls back to tank.

A chart showing the effect of the operation of the Collingwood plant is plotted on Fig. 5.

HYGROMETRIC CHART ADAPTED FROM AMERICAN AND INDIAN SOURCES

In determining the spray water temperature to meet the conditions required for de-humidifying, reference is made to the hygrometric chart shown in Fig. 6, and which has been adopted from various American and Indian sources to cover the range of atmospheric conditions usually met with throughout the Commonwealth. The weight of water vapor is generally given in grains per cubic foot and in this chart additional lines giving the weight in pounds per 1000 cu. ft. of air have been shown.

On the chart the relation is shown between dewpoint, dry-bulb temperature, humidity, wet-bulb temperature and weight of water vapor in the air. Comparing two specified conditions of 75° F. and 65° F. at 65% relative humidity, the diagrams give T—T_1 as 8¼° and 7°, respectively, and vapor content as 1.1 and 0.8 lbs. per 1000 cu. ft. Draw lines through the points given and parallel to the lines of constant vapor to cross the line of 100% relative humidity or saturation. The point at which the saturation line is crossed represents the saturation or dewpoints of 63° F. and 51° F., such temperatures being read to the same scale as the dry-bulb temperature. The dewpoint represents the critical temperature at which condensation would commence if the air were cooled.

Theoretically, such dewpoints should coincide with the temperatures of spray water through which air could be passed to obtain the conditions of 75° or 65° and 65% R.H., but a practical margin has to be allowed to cover the difference between the temperature of the water to enable heat to flow from the air to the water and the rise in temperature of the spray water cooling the air. In addition, some water in suspension is carried through the washing chamber with the air and which evaporates when the treated air picks up heat in its passage through the ducts and increases the apparent water vapor content.

This difference between the temperature of the required dewpoint and the spray temperature varies as the temperature of the incoming air from 8°, at low temperature, to about 16°, at high temperature, and a spray temperature of 40° F. has generally been found satisfactory.

OPERATING CONDITIONS IN SOUTH BRISBANE TELEPHONE EXCHANGE

A plant recently designed for Brisbane conditions resulted as shown in Figs. 7 and 8. The plant was designed on the same lines as for Melbourne conditions, and experiments show that some advantage will accrue from increasing the air cooler curtain for condenser water and the condenser surface in subsequent Queensland installations. An increase of 25% has been allowed over the Melbourne practice, in which 25 sq. ft. of air cooler curtain, 7600 cu. in. piston displacement, 130 ft. of 1¼-in. expansion pipe and 130 ft. of 1¼-in. condenser pipe are allowed per rated ton of refrigeration.

Fig. 9 shows an analysis of four sets of conditions in similar rooms, indicating, to some extent, the limits to which air conditioning can be effected without refrigeration.

It will be noted that, where refrigeration is resorted to, the actual cooling effect is very much in excess of the rated, and experiments made with a view to obtaining a little more light on this matter are plotted in Fig. 9 and show that considerable saving in refrigeration can be obtained by maintaining the spray temperature as high as possible. From the curve it is seen that, with a spray temperature of 45°, three times the cooling is effected, compared with spray water at 35° F.

For the Commonwealth Parliament House, Canberra, ventilation and air conditioning are provided for the two debating chambers and the library. The plant is generally on the lines described for the automatic telephone exchanges, and has a capacity of 36,000 cu. ft. of air per minute with 18 tons of refrigeration per 24 hours, or at the rate of ½ ton per 1000 cu. ft.

CHANGES MADE TO IMPROVE CONDITIONS

From the experience gained on the plants designed and in operation, a number of improvements

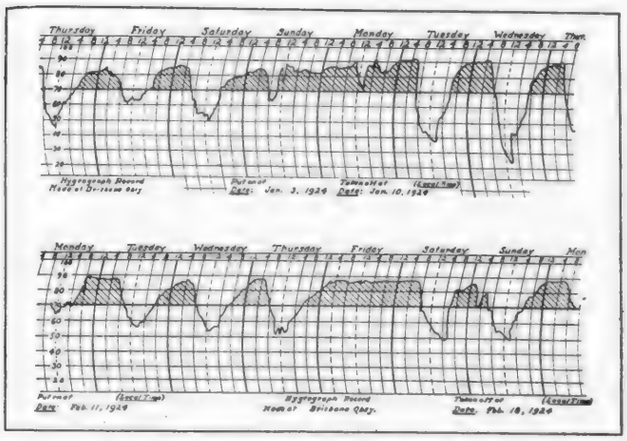


Fig. 7. Hygrograph Record for Brisbane

involving minor alterations have been adopted and are being put into practice as opportunity offers.

Most of the buildings treated are single story and are constructed of brick with reinforced concrete roof, shielded from the rays by a hipped roof of iron or tiles, the outer concrete surface being subject to shade temperatures not exceeding 110° F., compared with 160° F. if subjected to direct sun's rays.

Under the worst conditions a large volume of air is discharged to atmosphere at temperatures rarely exceeding 82° F., and this air is now being diverted through the roof space and is expected to maintain the outer surface of the concrete ceiling at a temperature not exceeding 90° F., with considerable saving in refrigeration.

DOUBLE SASH BEING USED

In multi-story buildings, the greatest thermal loss is through window glazing. The practice here will be to provide double sashes for windows, arranged with regulatable outlets at the top of the inside glazing and with similar openings at the bottom of the outer sash. The expenditure will be amply repaid, especially in lower-temperature process rooms.

NOTES ON AMMONIA CONDENSER DESIGN

The atmospheric type of ammonia condenser has generally been adopted and, while such a condenser is basically wrong from a thermal efficiency standpoint, it has the undoubted advantage of ready accessibility. Two methods of improvement have been suggested, one being to provide a supplementary submerged cooler to replace the upper coils of the condenser, dealing with the hottest gas direct from the machine and cooled by the condenser water in its passage from the condenser tray to the cooler supply tray.

The alternative is to submerge the entire condenser arranged for contraflow cooling; that is, having the cooled water enter the condenser at the bottom in contact with the cooled gas, and drawn from the top of the condenser for distribution over the air cooler. The latter proposal is favored on account of its simplicity. The reduction in the cooling surface will compensate for the extra cost of the tank, while the water cooler will be less conspicuous than when placed above the condenser. This arrangement lends itself to further improvement in the direction of forced air currents to obviate the difficulty due to absence of wind.

THE TREND IN DESIGN OF REFRIGERATING MACHINES

A wide range of types of machines is now in use under comparative conditions of duty, includ-

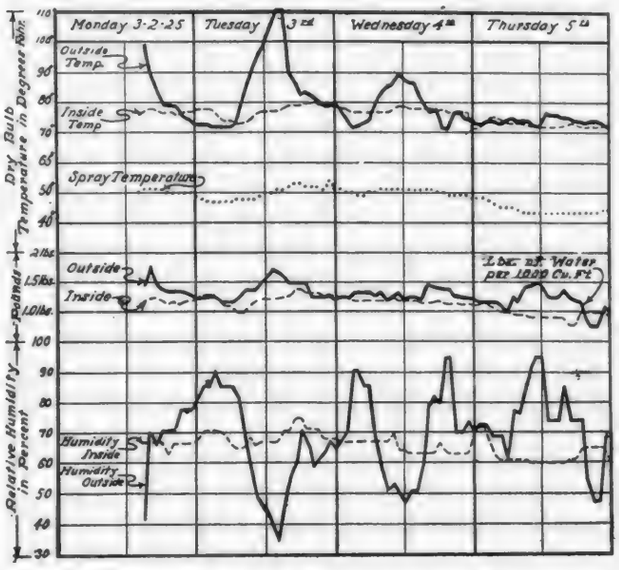


Fig. 8. Chart Showing Temperature and Humidity Variations for South Brisbane Telephone Exchange

ing low-speed horizontal with poppet valves (double acting) and with plate valves, high-speed horizontal with feather weight valves, high-speed vertical with both plate and poppet valves and low-speed vertical with poppet valves. There is considerable difference in the operating characteristics of the different types.

Tests and observations are now in progress, but will take some time to finalise. As far as these tests have gone, it would appear that there is considerable room for improvement in design, and it is possible that for small machines up to 30 tons capacity, a vertical high-speed single acting unit, with three cylinders and featherweight valves, with all motion gear enclosed and provided with forced lubrication, will take the field. For larger machines we may look forward to vertical units of two, three or four-stage compression, fitted with mechanically-operated valves, with motion gear, similarly enclosed, and forced lubrication.

AIR TREATMENT FOR PROCESS ROOMS

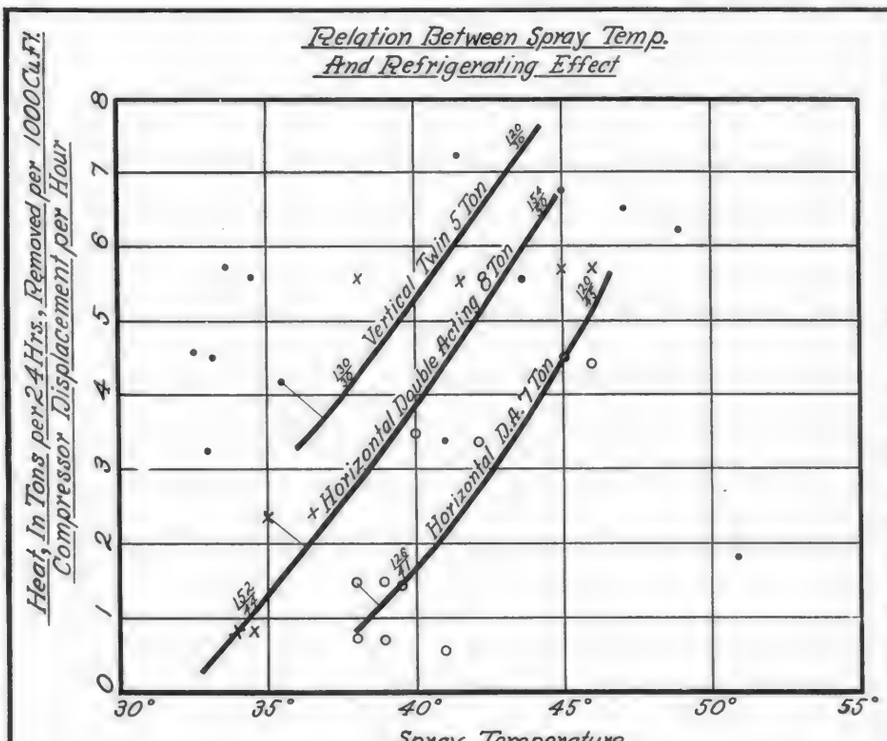
Air treatment for process rooms, including those for confectionery manufacture, is being developed along two lines, the first and earlier practice being to deliver the conditioned air into the vats or process vessels, the escape from such vessels being used to improve the general ventilation of the process room. The second and later practice is to provide adequate general ventilation for the whole room.

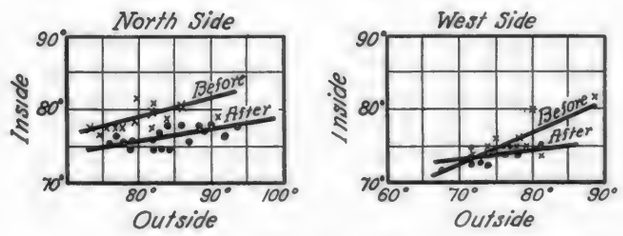
In former practice the air leaving the process vessel is usually charged with essential vapors, objectionable as regards human occupancy. Health regulations throughout the world are demanding that such vapors be withdrawn from as near as possible the point at which they are generated, and treated before discharge to atmosphere. In rooms designed with due regard for thermal effect, the general ventilation offers many advantages, not the least being that a higher spray temperature is permissible in the conditioner. Also, staff comfort and welfare is now regarded as necessary for economic output.

As evidence of the keen interest and attention given by members, quite a large number of questions were asked and answered fully by Mr. Lewis.

In reply to the chairman's and members' questions on the relative value of direct expansion coils in cold stores, compared with indirect cooling, in which the air is continuously recirculated through brine sprays, installation and operation costs are considerably in favor of the direct-expansion system, but the maintenance of circulation, with the air washed by means of brine, has an appreciable effect in checking mold growths. In this regard some advantages would accrue during periods of loading and unloading of cold stores if external untreated air were kept out of the cold store. This could be effected by maintaining a slight pressure in the cold store, which would insure an outward flow of air when the doors are opened.

Considerable refuse is removed from the air during the air-washing process described, and while provision is made for "sludging" the cooling tank, an amount of thick sludge, approximately 5 cu. ft., was recently removed from a tank in a plant having a capacity of 8000 cu. ft. per minute, after intermittent service for two months.


Relation Between Spray Temp. And Refrigerating Effect
Heat, In Tons per 24 Hrs., Removed per 1000 Cu. Ft. Compressor Displacement per Hour
Vertical Twin 5 Ton
Horizontal Double Acting 8 Ton
Horizontal D.A. 7 Ton
Spray Temperature
30° 35° 40° 45° 50° 55°
0 1 2 3 4 5 6 7 8



Air Conditioning
Effect of Painting Outside of Windows on Temperature Inside of Room

WITHOUT REFRIGERATION

	D.B.	W.B.	Hum.	D.Pr.	Lbs. Water /1000C.F.	Total Heat /1000C.F.
External Air	82	66	42	57	.85	2150
Inside Room (Untreated)	72	67	77	64	1.15	2200
Treated Air	65	62	85	60	1.0	1950
Switch Room	82	72	68	66	1.2	2600

With Spray Water at 59°F.

Cooling Effected Equivalent to 9 Tons Refrig./Day/1000 Cu. Ft./Min.

WITHOUT REFRIGERATION

	D.B.	W.B.	Hum.	D.Pr.	Lbs. Water /1000C.F.	Total Heat /1000C.F.
External Air (Inlet Register)	59	48	42	36	.4	1400
Entering Room	66.5	55.5	48	46	.65	1650
Leaving Room	66.3	54	42	44	.6	1600
Leaving Outlet (Register)	64	55	56	48	.7	1650

WITH REFRIGERATION

	D.B.	W.B.	Hum.	D.Pr.	Lbs. Water /1000C.F.	Total Heat /1000C.F.
External Air	66	60	71	56	.81	1850
Inside Room (Untreated)	71	64	68	60	1.0	2050
Treated Air	56	53	82	51	.74	1550
Switch Room	60	57	83	55	.85	1750

With Spray Water at 48°F.

REFRIGERATING PLANT

Rated at ½ Ton/Day/1000 Cu. Ft./Min.
Actual 1.33 Tons/Day/1000 Cu. Ft./Min.

WITH REFRIGERATION

	D.B.	W.B.	Hum.	D.Pr.	Lbs. Water /1000C.F.	Total Heat /1000C.F.
External Air	109	84	35	76	1.7	3430
Inside Room (Untreated)	79	71	68	68	1.3	2450
Treated Air	72	66	73	63	1.1	2200
Switch Room	77	69	67	66	1.2	2350

With Spray Water at 51°F.

REFRIGERATING PLANT

Rated at 1 Ton/Day/1000 Cu. Ft./Min.
Actual at 5.8 Tons/Day/1000 Cu. Ft./Min.

Fig. 9. Relations Between Spray Temperature and Refrigerating Effect With and Without Refrigeration

Assembling, Testing and Painting Electric Steam Radiators

Modern and labor-saving methods in the assembling, testing and painting of electric steam radiators are in use at the plant of the Tesra Manufacturing Company, San Francisco. This concern manufactures electric steam radiators for all purposes, both domestic and industrial.

An interior view of this plant is shown in Fig. 1,

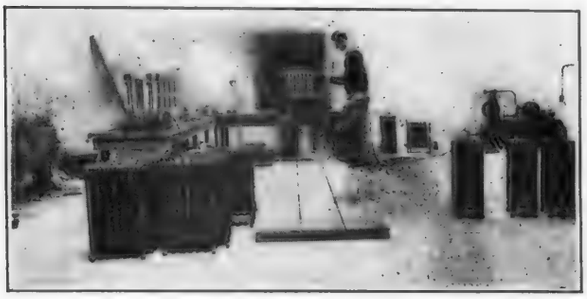


Fig. 1. Interior View of Plant When Electric-Steam Radiators Are Assembled

where it is seen that the radiators are stocked on the floor, at the end of an L-shaped platform, the top of which is 28-in. above the floor. The various accessories, such as filler caps, heating elements, safety valve and air release valve, are there screwed into their respective positions, and the radiator is then placed on the working bench.

After being set on the platform, the next operation is the attachment of the electric switch and the thermostat; this completes the assembly of all the material parts of the radiator, and it is then ready for painting.

For this purpose, the radiator is placed on a dolly, running on castors, and is rolled up the bench to a point directly in front of the suction fan (Fig. 2), where the paint is applied by means of a pneumatic air-brush. Air for the brush is supplied by a small United States air compressor. The suction fan is of sufficient capacity to remove all fumes immediately and thus provide ideal working conditions for the painter.

Fig. 2. Painting the Electric-Steam Radiators in Front of an Exhaust Fan

The final test of the radiator is then made, and for this purpose, the radiator is swung, by means of an overhead conveyor, over to a separate test bench (Fig. 3), where the current consumption is measured by a wattmeter, a voltmeter being used to check the voltage, and a thermometer to test the thermostat operation for temperature and coordination.

This operation test is run for a number of hours, to demonstrate that the radiator is properly functioning, and to detect any imperfections, of any character, which might exist.

Electrical outlets and switches for the final test are conveniently arranged along the wall, within easy reach of the testing man, and are fixed so as to eliminate lost motion, as far as possible.

After satisfactorily passing the final test, the radiators, known as the Tesra electric-steam radiators, are ready for delivery to the purchaser, and are stocked ready for crating and shipment.

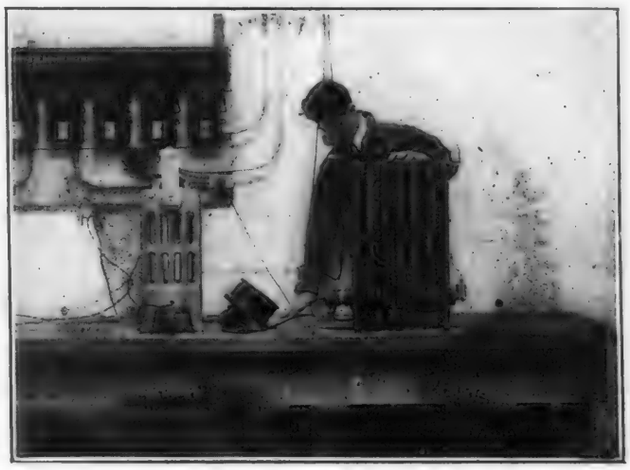


Fig. 3. Testing the Electric-Steam Radiator for Control Action and Operation

Engineering as a Profession

IN a lecture on engineering, by Charles Edward Lucke, professor of mechanical engineering, Columbia University, New York, and published in *Mechanical Engineering* for November, he takes the position that engineering is a profession that stands beside law and medicine.

Professor Lucke considers it strange that, with engineering so widespread and so tightly knitted into the fabrics of all nations, such a small part of the general public really understands what the terms "engineer" and "engineering" actually imply. This may be brought about by two causes: first, the engineer is usually acting for someone else and, therefore, is not a principal; and, second, the engineer is usually dealing with problems of *things*, so big and involving so many details that he gradually becomes a thinker, rather than a talker; thus many opportunities of self-advertisement become to him a seeming waste of valuable time.

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IF anything were needed to show the place heating and ventilation occupies as a separate and distinct industry, it was furnished at the recent Power Show, in New York. Not only was there an impressive array of heating and ventilating exhibits, but on the directory which met one's eye as he entered the hall, the management had taken the trouble to segregate all the heating and ventilating exhibitors and to display prominently at the head of the list "Heating and Ventilating Section." Some 180 manufacturers were so listed.

An inspection of the displays themselves, however, led to some curious surprises. Here were firms well known in the heating industry, properly grouped on the directory, but whose displays were confined almost wholly to power appliances or applications. More than one well-known manufacturer of ventilating fans, for instance, gave a prominent place to forced and induced-draft fans, but not one inch to the types commonly used in ventilating work. Boiler displays were fairly numerous, but those of house-heating types were conspicuous by their absence. Pump manufacturers relegated to the background their displays of types adaptable for heating but gave prominence to the types used in power work.

There is nothing surprising in the treatment accorded heating exhibits at the Power Show. Almost every firm represented had one or more appliances suitable for power application and it would be too much to expect that any exhibitor would want to give the impression, in a power show, that he was only indirectly connected with that field. On the same ground, it is easy to understand why the heating and ventilating exhibitors did not favor a proposed plan to herd them in one section of the exhibition hall.

TWO facts stand out prominently as the result of the effort to incorporate a heating and ventilation show in a power exposition. One is that the industry has grown to proportions but little appreciated by outsiders and not wholly realized even by the old-line firms in the business. The other is that any attempt to attach a heating show to that of any other industry won't work. It won't work because their lines are bound to diverge almost from the start. The more progress in the art, the greater the divergence. They talk in different terms. They speak a different language. In short, they don't mix.

Whatever may transpire this year, or next, it is becoming as plain as day that the heating and ventilating industry will have, and by right should have, an exposition of its own, devoted exclusively to the advances in this particular field. The industry has the importance, it has the strength and it has the "goods" to put over its own show in a big way.

"HOW many gallons of oil equal a ton of coal?" promises to become as much of a classic as many of the riddles of the ancients which remain unanswered to this day. On a heat unit basis it is easy, of course, to equate the two, but the problem is not so simple as that. The reason is that the home-owner is not so much interested in the production of heat as he is in its utilization. On a mild day, for instance, when no heat is needed, what happens to a coal fire? Some combustion goes on because it is still necessary to keep the fire burning against any sudden temperature drop. With gas or oil no such condition obtains, for any equipment worthy of the name is provided with means for cutting off the fuel supply entirely when heat is not needed. In this respect we have the paradox of what is actually a negative efficiency. From this point of view there are long periods at both extremes of the heating season when, with solid fuels, negative efficiencies will occur from conventional handling of the heating plant.

The amount of utilizable fuel is what interests the home-owner and this, after all, is the determining factor in any comparison of solid and liquid fuels for domestic use.

"How Many Gallons of Oil Equal a Ton of Coal?"

Vigorous Protest by Anthracite Coal Service Fails to Consider Question from Operating Standpoint

IT IS necessary that the first person plural appears in what follows, as it relates to a letter addressed to the editor by an official of *Anthracite Coal Service*, in which exception is taken to a portion of an article in the November issue entitled "*Anthracite* Mixes Facts and Fiction."

In the first place, it is to be noted that no explanation is made of the misrepresentation of facts in connection with the operation of domestic oil burners in New York were referred to a non-partisan board, fully acquainted with the situation, as is the National Board of Fire Underwriters or the National Fire Prevention Association, the existing rules, that add some two hundred dollars to the cost of an average installation, would be replaced by the standard code sponsored by these organizations, and oil burners could be sold and installed in

This is a matter of such simple arithmetic that no authorization is needed. We are ready to admit it, with no qualifications. But the home-owner is not so much interested in the *production* of heat as he is in its *utilization*, and this is the phase of the situation that *Anthracite* obviously has not considered. You can burn a ton of coal, or a pound or gallon of oil, or a unit of gas, but, unless the heat developed can be utilized,

IT may not be out of place to point out what we hope is self-evident, that The Heating and Ventilating Magazine is no more an "oil-burner magazine" than it is a gas or coal magazine. The heating industry has suddenly, out of a clear sky, been confronted with an offspring that has blossomed over night, like the girl child of yesterday who to-day is a young woman, or the gangling youth who, in a space of months only, passes from knickerbockers to golf togs and overtops his dad. The oil-burner group, as we see it, is a mighty important member of the heating industry family, and so are those sponsoring the gas-heating wave, which we feel will become the most serious rival of the oil-burner interests. So, The Heating and Ventilating Magazine is as much interested in domestic heating with oil and gas as it is in the use of solid fuel.

As we see it, the oil-burner industry was, in the flush of its splurge of the last few years, beset with a serious infection that threatened to rob it of its logical growth. The oil burner had been over-sold by all but a very few of the manufacturers. Its literature was filled with the most grotesque statements and ideas. So wild was the average catalog in its statements, and so weird in its coined terms, that disbelief was the inevitable result of its circulation among average home owners.

The Heating and Ventilating Magazine, realizing the danger to the industry, was the first instrumentality to take a definite stand against "loose sales talk," even to the extent of openly, in its editorial columns, "roasting" the copy appearing in catalogs of its advertisers. Fortunately for the industry, those at the helms of the larger organizations were men of such caliber that they understood the motive of the magazine, and a co-operative reaction was almost instantaneous. One manufacturer actually discarded an entire new printing of a catalog and proceeded, at no small expenditure, to replace it with a new catalog, in which the presentation was technically correct and infinitely stronger as retail ammunition.

This explanation is made because a similar condition has developed which, if not checked, will work great harm to those engaged in the production and marketing of coal. It is our sincere hope that we may be able to be of real service to the coal industry by pointing out the short-sightedness of a policy that seems to be gaining ground throughout the country—that is, the fallacious idea that the way to sell coal is to discredit oil.

Not long ago, a coal-trade magazine undertook to present to its readers a picture of the oil-burner industry in the shape of a series of articles purporting to represent facts. To an unbiased mind, acquainted with the situation, the thing so reeked with bias that actually it was funny. An official of the Underwriters with whom it was discussed remarked that it was "utter rot, but so vaguely written that it is difficult to pin down the misstatements."

Now it appears to us that the proper function of any coal-service bureau (and we do not refer specifically to Anthracite Coal Service), or of any coal dealer, is to merchandise coal. "Coal service," and not "slam the oil burner," should be the slogan. So, when we undertook to point out to readers of The Heating and Ventilating Magazine that "Anthracite" was mixing its functions, and twistificating facts and fiction in the doing, it was with the best intent, that is, the desire to present facts, with no leanings toward oil, or gas, or coal, and only with the hope that each phase of the industry would "stick to its knitting" and not try to develop by the process of knifing the others.

We are glad to give space to the letter referred to, and hope that the discussion of the points involved will prove of benefit to those directly or indirectly interested in the development of the coal and oil industries.

situation in New York City. There seems to be a widespread attempt on the part of those interested in the sale or use of coal as a domestic fuel to paint the situation in New York as typical of the country at large. On the contrary, the rules and regulations of the Board of Standards and Appeals are probably unapproached for severity in any other city in the United States.

We have been given to understand that, if the problem of formulating rules and regulations for the installation and New York City under the same conditions that obtain in any other large city. It is interesting, we feel, that this phase of our criticism was not touched upon.

HEAT CONTENT OF OIL

Our correspondent states that "it requires at least 170 gal. of oil to produce the heat units obtained from one ton of anthracite.", and adds that this statement was "authorized by the *Anthracite Coal Service*."

the combustion has been in vain.

So, if it can be shown that, in the *utilization* of heat developed from the combustion of oil or of gas, for we are considering "fluid fuels" against solid fuels, we can do thus-and-so, while, in the utilization of solid fuel, entirely different conditions obtain, we may upset the apple cart so carefully loaded with B. T. U., and establish an entirely new appreciation of the wide difference be-

(Continued on Page 90)

In This Letter Anthracite Coal Service Maintains That the Ratio of 170 Gallons of Oil Fuel to One Ton of Anthracite is a Real Measure of Relative Heat Values to the Home Owner.—Is It?

EDITOR HEATING AND VENTILATING MAGAZINE:

On Page 109 of the November issue of your magazine under the caption "'Anthracite' Mixes Facts and Fiction," you state that "THE HEATING AND VENTILATING MAGAZINE has made its position perfectly clear in regard to loose sales talk, particularly in regard to oil burner advertising. The code of ethics formulated by the magazine . . . has been characterized as largely instrumental in bringing about better conditions in the industry."

We believe that this statement is based upon absolute sincerity on the part of your editors and that your publication stands ready to absolve those to whom an injustice has been done through misstatement of fact, even though such misstatement is made by the editors of your excellent publication. We fully expect, therefore, to see the following comment on the article to which I have referred above given space in an early issue of THE HEATING AND VENTILATING MAGAZINE which will be of at least equal prominence to that given the article in question.

I am particularly interested in that part of the article wherein the publication "Anthracite" is quoted: "As a matter of fact it requires at least 170 gal. of oil to produce the heat units obtained from one ton of anthracite," since this statement was authorized by the Anthracite Coal Service.

You state that "it ignores the fact that with oil the over-all efficiency for the heating season is so much higher than with coal, as irrefutable evidence shows cases where 100 gal. of oil have been equivalent to a ton of coal." We challenge that statement and claim that it is impossible of proof, and in substantiation of that challenge we offer the following:

Combustion engineers and boiler manufacturers will agree that a 7-lb. evaporation with anthracite is a conservative average accomplishment, and, as an equally conservative average, anthracite B. T. U. content is 13,000 per pound. On this basis and with oil at 19,000 B. T. U. per pound, weighing 7.4 lbs. per gallon, the corresponding oil evaporation to enable 100 gal. of fuel oil to equal a ton of coal must be 18.9 lbs. per pound of oil.

Translated into terms of efficiency, this would mean that the over-all efficiency of the burner and boiler or heater burning oil must be over 96%. The impossibility of such an achievement need not be pointed out to any engineer who is conversant with heating systems.

On the other hand, engineers will acknowledge that the efficiency which we have assumed with anthracite—7 lbs. evaporation per pound of anthracite, containing 13,000 B. T. U. = 52%—is a conservative annual average.

With the fallacy of an equivalent of 100 gal. of oil to a ton of coal having been clearly demonstrated, we beg permission to return to our original statement that 170 gal. is a fair and conservative equivalent to a ton of anthracite.

This result is verified by using the above-stated evaporation and efficiencies on anthracite. The efficiency of operation with fuel-oil you can calculate and will give a result of 56.75%. It is, therefore, shown that in obtaining this comparison the efficiency of the domestic oil-burning installation was conceded to be as much higher than the efficiency of the anthracite burning installation as could properly be claimed, and had the writer of your article—"'Anthracite' Mixes Facts and Fiction"—taken the trouble to run through these calculations before publication, this fact would have been apparent to him.

Among the impartial authorities who have tested oil and anthracite, under the actual home-heating conditions, is Dr. Fernald, head of the Towne Scientific School, University of Pennsylvania. Deductions made from his exhaustive tests show the equivalent of oil to anthracite, in the domestic installation, ranges from 165 to 235 gal. per net ton (2000 lbs.). Therefore, if we have erred in our comparative statement, such error has been on the side of conservatism, in that we have not taken advantage of the more favorable comparison which is accorded us by well-qualified and impartial investigators.

As an unbiased source of information, it is truly deplorable that your magazine should make the statement that no quantity of oil can be equated to a ton of coal as a heating medium, since it is perfectly certain that to arrive at the actual cost of fuels, oil can and must be equated to a ton of coal. Moreover, the man who is heating his home is the man who is to decide whether or not the amount of his fuel bill is material to him, and I am sorry to be forced to conclude that the article to which I have referred in THE HEATING AND VENTILATING MAGAZINE has not only resulted in keeping from the home-owner the information which he desires and which he has a right to expect, but also has, through its "irrefutable evidence where 100 gal. of oil have been equivalent to a ton of coal," fostered and exemplified the "loose sales talk" against which the code of ethics formulated by the magazine is based.

ANTHRACITE COAL SERVICE,
C. A. Connell, Assistant Manager.

(Continued from Page 89)

tween the *utilization* of fluid and solid fuels.

HEAT PRODUCTION AND HEAT UTILIZATION

Our correspondent tells what the "combustion engineers and boiler manufacturers" have found in regard to evaporation. Now "evaporation from and at" does not interest the home owner, although it is of no small importance to the research department. And the "efficiency" figure that is obtained in the test room is not a measure of the "efficiency" upon which the home owner pays his fuel bills. One is the efficiency of heat *production*, and the other is the efficiency of heat *utilization*, and they are not one-and-the-same.

The efficiency of the test room has a very definite range. It may be anywhere between 0% and 100%. Less than 0% would be as comical as 116%. But we wonder if our correspondent has ever thought of an efficiency of utilization of *less than 0%*—actually *a negative efficiency.*

Now a negative efficiency is a reality when burning solid fuel, considered from the standpoint of the home owner. Every home owner, without exception, pays for coal and burns it *when heat isn't wanted.* In the laboratory, if 500 lbs. of coal is burned, a certain amount of heat is developed, and the ratio of the heat available at the boiler outlet to the heat value of the coal is a measure of the efficiency of the boiler. The same would be true if 500 lbs. of oil or 500 cu. ft. of gas were burned.

BANKED FIRES DURING PERIODS OF NO HEAT DEMAND

But suppose that, next April, a balmy day arrives, with a temperature of 65° or higher. The home-owner with a coal fire banks it, but does not let it go out, as the next day, or the next, may see a sudden drop in temperature that demands heat. In the meanwhile *no heat is needed but the combustion of coal goes on.* The heat developed may be at such a low rate that it merely raises the indoor temperature a degree or two, but, in many instances, windows will be opened to permit *unwanted* heat to escape. *Is this efficiency in the utilization of fuel?* Yes, it is *negative efficiency* and it is of common occurrence in every home heated with solid fuel, Fall and Spring.

In those sections where Winter comes with a rush there are fewer days when a negative efficiency will be found, but if a chart is made of degree-days for more temperate climates, such as that for Seattle (See THE HEATING AND VENTILATING MAGAZINE, for December, 1925) it is evident that there are long periods at both extremes of the heating season where, with solid fuels, actual negative efficiencies will result from conventional handling of the heating plant.

LIQUID FUEL CUT OFF WHEN NO HEAT WANTED

With fluid fuels this condition practically does not obtain. The instant that indoor temperatures rise above the limit to which the thermostat is set, the fuel supply is cut off, to remain off until heat is again wanted. Heat is forthcoming if the room temperature drops but one or two degrees, in a day, or a week, or a month, *but is not developed for even an hour unless it is to be utilized.*

Herein lies one of the most important advantages of fluid fuels. Solid fuel can be burned under thermostatic control, but not to the extent of stopping the production of heat when no heat is desired and initiating combustion at whatever time heat may again be desired. And this accounts for the fact that, while 100 gal. of oil does not equal a ton of coal, and 170 gal. of oil does not equal a ton of coal—for no equating of this kind can be made when we consider the *utilization* of the fuels—it has been found possible to make 100 gal. of oil fuel produce the same amount of *utilizable* heat that is produced by a ton of coal, and that is what interests the home owner.

The situation, as we see it, is that *Anthracite* represents those in the coal industry who view the problem through a color screen; they do not see the picture in all of its tints. If we might carry the simile another step, we might suggest that the shades of red in the picture represent laboratory results, and these good people use glasses that screen off all colors other than the red portion of the spectrum.

OIL-BURNER MANUFACTURERS DISSUADED FROM EQUATING OIL WITH COAL

It has been the policy of THE HEATING AND VENTILATING MAGAZINE to dissuade oil-burner manufacturers from making statements of the "number of gallons of oil that equal a ton of coal" for the reasons above given. Gallons of oil may be equated to cubic feet of gas, as the two fluid fuels are capable of developing utilizable heat in the same way, although any fair-minded individual would readily admit that, of the two, the gas-fired plant is the more desirable. On the other hand, the same individual must admit that oil is a superior fuel to coal in many ways; *in the efficiency of utilization;* in the light of permitting entire automatic control.

The oil burner of to-day, may be no nearer perfection than was the curved-dash Olds of the 90's, but the indications are that its period of development to a status parallel with the "straight eight" of to-day will be much less than was the case with the automobile.

THE HEATING AND VENTILATING MAGAZINE is keenly interested in technical developments in the oil-burning industry, in the gas-heating phase now being initiated, and, particularly, in the improvements that are bound to come, in handling, firing and utilizing solid fuels in the home. If those whose interests lie in such constructive channels would refuse to be diverted to the shoals of discord, by misrepresenting facts about the other fellow, much greater progress toward the ultimate port would result.

We see in *Anthracite Coal Service* a potent force for securing and passing on data of great value to the coal-using public, and we shall be glad to use the editorial pages of the magazine to pass on such information to our readers. But we have no choice other than to reiterate our thoughts on "Facts and Fiction" for the reasons above set forth.

Cave Dwellings, as a Solution of Weather Troubles, Made Feasible by Modern Ventilation

"TO escape the vagaries of bad weather, we might start an underground civilization aided by modern ventilation and up-to-date electrical apparatus," is the almost weird suggestion attributed to W. S. Currier, head of the U. S. Weather Bureau, Toledo, by the *Trenton (Mo.) Times* for September 25, 1926.

Mr. Currier is quoted as saying that: "Folks in scores of American cities of the future may drive on underground roads, live in underground homes, and work in underground offices as a result of the development of the science of ventilation of electrical air control.

"That will be one way of getting away from the vagaries of bad weather and solving the congestion problem in big centers of population. It would assure a supply of clean air in these subterranean passages, which was more than the cave dwellers of several thousand years ago had," he pointed out.

"Men juggle temperature and humidity around like so many balls, and create lake breezes by powerful fan machinery, but I doubt that they can manufacture weather for the great outdoors. Of course, wonders have been accomplished within buildings, but artificially-created rain, man-produced sunshine or snow, at command, is a challenge that is ridiculous.

"In Toledo and all over the middle west, in spite of complaints about the heat, the summer average is slightly below normal. The average temperature has been 71.0° F. and normal is 71.1°. June was four degrees below normal; July 0.04° below, and August 1.90° above.

"The moisture in the air, or humidity, drops as the day progresses if the sun is shining. Of course, the capacity of the air to hold moisture goes up with the temperature. And air takes up more space as its temperature rises. An ideal climate, other things being equal, would be a temperature at 85° and relative humidity below 50%. Air motion plays a big part.

"Moisture is good for vegetation, but not so good for animal life. The lake regions, naturally, have more moisture in the air than other sections of the country. Moisture brings about the sticky feeling. People often don't realize it's hot until the thermometer reminds them."

The Cast Iron House

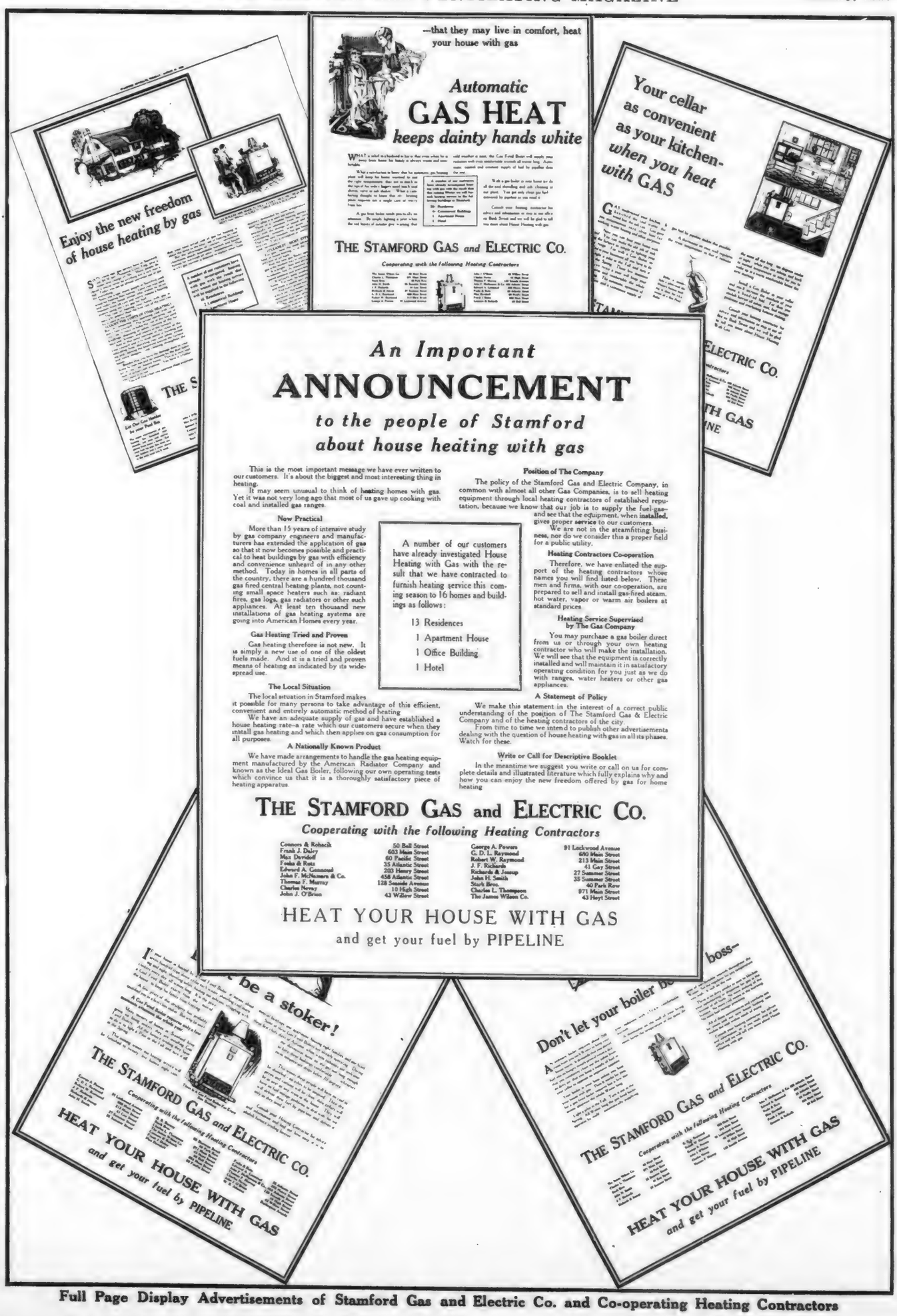
Considerable speculation has been aroused by the working out and constructing of a cast-iron house in Great Britain. The steel house previously experimented which proved objectionable on account of the connecting bolts which gave it the appearance of cheapness.

Walter MacFarlane and Company, Glasgow, Scotland, have developed a cast-iron bungalow, which is practically all of this material, being formed of cast-iron plates 3 ft. 7½-in. long by 2 ft. 6½-in. wide and 5/16-in. thick. These plates are cast with a specially rough exterior, so that, when painted, they have the appearance of stucco. While the first cost exceeds that of the steel house, the cast-iron construction will undoubtedly be more lasting and there is also a saving in time and labor of erection, the cast-iron house having been put up in as short a time as three days.

Gas Burning in 1926 Shows Gain

Gas to-day has ten uses in the modern homes, says *Gas Progress.* These include cooking, house heating, incinerating, garage heating, space heating and water heating.

In 1901, the annual sales of manufactured gas totaled more than 101 billion cubic feet. In 1925, over 421 billion cubic feet were sold—an increase of 300%. A recent survey of 1926 conditions indicates that the 1925 record will be surpassed, estimates running from 440 billion to 450 billion cubic feet.


Enjoy the new freedom of house heating by gas
--that they may live in comfort, heat your house with gas
Automatic
GAS HEAT
keeps dainty hands white
THE STAMFORD GAS and ELECTRIC CO.
Cooperating with the following Heating Contractors
Your cellar as convenient as your kitchen- when you heat with GAS
An Important
ANNOUNCEMENT
to the people of Stamford
about house heating with gas
This is the most important message we have ever written to our customers. It's about the biggest and most interesting thing in heating.
It may seem unusual to think of heating homes with gas. Yet it was not very long ago that most of us gave up cooking with coal and installed gas ranges.
Now Practical
More than 15 years of intensive study by gas company engineers and manufacturers has extended the application of gas so that it now becomes possible and practical to heat buildings by gas with efficiency and convenience unheard of in any other method. Today in homes in all parts of the country, there are a hundred thousand gas fired central heating plants, not counting small space heaters such as: radiant fires, gas logs, gas radiators or other such appliances. At least ten thousand new installations of gas heating systems are going into American Homes every year.
Gas Heating Tried and Proven
Gas heating therefore is not new. It is simply a new use of one of the oldest fuels made. And it is a tried and proven means of heating as indicated by its widespread use.
The Local Situation
The local situation in Stamford makes it possible for many persons to take advantage of this efficient, convenient and entirely automatic method of heating
We have an adequate supply of gas and have established a house heating rate--a rate which our customers secure when they install gas heating and which then applies on gas consumption for all purposes.
A Nationally Known Product
We have made arrangements to handle the gas heating equipment manufactured by the American Radiator Company and known as the Ideal Gas Boiler, following our own operating tests which convince us that it is a thoroughly satisfactory piece of heating apparatus.
A number of our customers have already investigated House Heating with Gas with the result that we have contracted to furnish heating service this coming season to 16 homes and buildings as follows:
13 Residences
1 Apartment House
1 Office Building
1 Hotel
Position of The Company
The policy of the Stamford Gas and Electric Company, in common with almost all other Gas Companies, is to sell heating equipment through local heating contractors of established reputation, because we know that our job is to supply the fuel-gas-and see that the equipment, when installed, gives proper service to our customers.
We are not in the steamfitting business, nor do we consider this a proper field for a public utility.
Heating Contractors Co-operation
Therefore, we have enlisted the support of the heating contractors whose names you will find listed below. These men and firms, with our co-operation, are prepared to sell and install gas-fired steam, hot water, vapor or warm air boilers at standard prices
Heating Service Supervised by The Gas Company
You may purchase a gas boiler direct from us or through your own heating contractor who will make the installation. We will see that the equipment is correctly installed and will maintain it in satisfactory operating condition for you just as we do with ranges, water heaters or other gas appliances.
A Statement of Policy
We make this statement in the interest of a correct public understanding of the position of The Stamford Gas & Electric Company and of the heating contractors of the city.
From time to time we intend to publish other advertisements dealing with the question of house heating with gas in all its phases. Watch for these.
Write or Call for Descriptive Booklet
In the meantime we suggest you write or call on us for complete details and illustrated literature which fully explains why and how you can enjoy the new freedom offered by gas for home heating
THE STAMFORD GAS and ELECTRIC CO.
Cooperating with the following Heating Contractors
Connors & Robacik 50 Ball Street
Frank J. Daley 603 Main Street
Max Davidoff 60 Pacific Street
Fenke & Reitz 25 Atlantic Street
Edward A. Gennoud 203 Henry Street
John F. McNamara & Co. 458 Atlantic Street
Thomas F. Murray 128 Seaside Avenue
Charles Newey 10 High Street
John J. O'Brien 43 Willow Street
George A. Powers 91 Lockwood Avenue
G. D. L. Raymond 680 Main Street
Robert W. Raymond 213 Main Street
J. F. Richards 41 Gay Street
Richards & Jessup 27 Summer Street
John H. Smith 35 Summer Street
Stark Bros. 60 Park Row
Charles L. Thompson 871 Main Street
The James Wilson Co. 43 Heyt Street
HEAT YOUR HOUSE WITH GAS
and get your fuel by PIPELINE
be a stoker!
Don't let your boiler boss--
THE STAMFORD GAS and ELECTRIC CO.
Cooperating with the following Heating Contractors
HEAT YOUR HOUSE WITH GAS
and get your fuel by PIPELINE

Full Page Display Advertisements of Stamford Gas and Electric Co. and Co-operating Heating Contractors

Local Heating Contractors United in Gas Heating Campaign

Stamford Gas and Electric Company Secures Co-operation in Advertising Plan and Starts Season with Forty-seven Installations

A CAMPAIGN for a househeating load involving some interesting features has been carried out during the Summer and Fall by The Stamford Gas and Electric Company, Stamford, Conn. As a result, a large enough number of such contracts has been secured to permit, at the conclusion of the present heating season, of analyses being made of the application of rates established as a trial basis.

As a matter largely of civic pride, the company exhibited gas heating equipment at an Exposition of Progress held in the municipal park last June, and the interest manifested was later capitalized into contracts for fourteen installations of househeating boilers. In July, the company initiated a forceful campaign for additional business with a dinner to local heating contractors, at which was discussed the mutual advantages of building up a househeating load in Stamford.

On August 3, a second meeting was called, at which a definite plan of co-operative advertising was discussed and accepted by twenty heating contractors, who agreed to contribute. A series of full-page advertisements was carried in the local paper, at weekly intervals, in which the plan of co-operation between the gas company and the contractors was outlined, and in which the names of the subscribing contractors appeared. These advertisements resulted in a large number of inquiries by telephone and in person.

During this campaign 27 contracts were closed, making a total of 41 installations for the first heating-season. The gas company adopted a policy of standardizing on one make of boiler, mainly in the interests of uniformity, ease of repair and service. The gas company acts as a distributor of the heating boilers, but handles none of the installation work.

A prospective customer is told that the installation of the gas-fired boiler is in every instance done by a local heating contractor, and it is suggested that his regular contractor be given the job. In such cases where the customer has no regular heating contractor, the gas company suggests several, including some of the smaller contractors, with the idea of spreading this work as far as possible.

In any event, the gas company provides such supervision as will insure a satisfactory installation.

RATE BASED ON DEMAND CHARGE PLUS METER RATE

The househeating rate is based upon two factors: The connected load and the quantity of gas consumed. The demand charge is 4 5/8 cents per cubic foot of demand per month, for the period from October 1 to April 30, inclusive. The meter rate is $1.30 per 1000 cu. ft. for the first 5000 cu. ft. per month and $0.60 per 1000 cu. ft. for all consumption in excess thereof.

It is interesting to note that only one meter is used, all gas for cooking, water-heating and other domestic purposes being subjected to the one rate.

MONTHLY INSPECTION PROVIDED FOR FIRST HEATING SEASON

The gas company undertakes to maintain monthly inspection of the heating plants, together with such service as may be required, during the first heating season, without charge. Service charges for beyond this period will be determined by this season's experience.

The monthly inspection is brought to the attention of the customer by an inspection card that is signed by the inspector and left for record and reference. A blank space is provided for remarks or suggestions as to more intelligent use of the gas-fired installation. The regular receipt of this card by the customer is a reminder that the gas company is seriously attempting to provide him with "heating service" by removing all possible chances of maloperation of the equipment and by doing everything possible to insure minimum consumption of gas for a given load.

The company also intends to provide for a thorough cleaning of the boiler at the end of the heating season, in order that the efficiency of the equipment may be maintained.

In addition to the domestic heating plants sold, the gas company has had installed several boilers in business houses in Stamford. One shoe store found that, through the gas-boiler installation, it was possible to use for much desired storage, a basement that had been impossible when coal fuel was used.

INSPECTION CARD

Date_____

Your Gas Fired Boiler was inspected today, and all operating parts are working properly.

Remarks_____

_____

_____

_____

_____

The Stamford Gas & Electric Co.

by_____
Inspector

Card Used by Inspectors, Stamford Gas and Electric Company

Fall River Gas Works Co-operates with Local Contractors

Another example of the effectiveness of a close tie-up between a gas company, selling gas for heating purposes, and the local heating contractors is found in Fall River, Mass. In this city 15 installations were made in 1924, 30 in 1925 and 53 in 1926.

The rate for gas for heating is 75c. per 1000 cu. ft., if bills are paid within 15 days. Gas used for other than heating purposes is passed through a separate meter. The gas company employs two heating engineers, who check all buildings prior to acceptance of contract.

The company has had a system of co-operation with the local heating and plumbing contractors of that city in operation for several years. During the past year this has taken definite form. The company gave a dinner at which the majority of the contractors in the city were present. These contractors chose three of their members as a committee to meet with three men appointed by the gas company, forming a committee to deal with matters of mutual interest.

This committee has held monthly meetings at which the prices, commissions, and installation specifications of all appliances handled by either the contractors or the gas company have been discussed. Price sheets have been printed giving the following information on each item:— the time price, the cash price, the first payment, payment per month, the number of months, the sale price to the contractor delivered with no connections, the sale price to the contractor delivered and gas connected, and the commission to the contractor. The last mentioned has been used where the con-

tractor has sent a prospect to the company on the regular forms provided, and the sale and installation has been handled by the company.

A monthly letter has been written from the committee to the contractors, discussing various points which have been brought up at these meetings. The results of this work have been entirely satisfactory from the viewpoint of both the company and the contractors.

The company is frequently bringing the matter of merchandising only approved appliances to the attention of the contractors and looks forward to the time when an agreement will permit only appliances carrying the "Blue Star" of approval to be sold in Fall River.

American Society of Heating and Ventilating Engineers

Plans Completed for Society's Annual Meeting

The St. Louis Chapter is doing everything possible to make the A.S.H. & V.E. annual meeting, January 26-28, the largest and most successful of any annual meeting the society has ever held. This meeting will be a novelty in one respect at least, in being the first annual gathering of the society ever held west of the Mississippi River.

A lively program is in process of formation for the entertainment of visitors by the various committees, of which the following are already functioning: Finance, V. D. Rossman, chairman; program and publicity, William C. Sodemann, chairman; entertainment, R. K. Milward, chairman; hotel, A. E. Humphreys, chairman; transportation, E. A. White, chairman; automombile, C. A. Pickett, chairman; ladies, Mrs. R. E. Graves, chairman.

Following is the tentative program of the meeting:

TUESDAY, JANUARY 25, 10:00 A. M.

Committee meetings:
- Research.
- Technical Advisory:
  - Sub-Committee on Subjects
  - Sub-Committee on Infiltration
  - Sub-Committee on Radiation
  - Sub-Committee on Pipe Sizes
  - Sub-Committee on Temperature, Humidity and Air Motion
  - Sub-Committee on Heat Transmission Through Building Materials
  - Sub-Committee on Rating Low-Pressure Boilers.

Council meeting.

Council Committees:
- Executive
- Finance
- Membership
- Publication

Technical Committees.

WEDNESDAY, JANUARY 26, 10:00 A. M.

Greeting by president.
Report of Council.
Paper: "Heating Effect of Radiators" by Dr. C. W. Brabbee.
Report of secretary.
Paper: "The Effect of Painting Radiators," by Professors Severns and Willard.
Report of Committee on Increase of Members, C. V. Haynes, chairman.
Paper: "Chimney Sizes for House Heating," by R. V. Frost.
Report of tellers of election.

WEDNESDAY, JANUARY 26, 1:30 TO 4 P. M.

Paper: "Insulation of a Residence," by Lee Nusbaum.
Reports of officers and council committees.
Paper: "Design and Application of Oil-coated Air Filters," by H. C. Murphy.
Paper: "Simple Method of Testing Air Filters," by H. G. Tufty and E. Mathis.
Report of Committee on Code for Testing Air Filters, Professor F. B. Rowley, chairman.
Paper: "Design and Operation of Hotel Heating and Ventilating Systems," by Benjamin Natkin.

THURSDAY, JANUARY 27, 10:00 A. M.

Schoolhouse Ventilation

Report of Rochester Committee, Perry West, chairman.
Paper: "Practical Aspects of Heating and Ventilating of Schoolhouses," by H. W. Schmidt.
Paper: "Modern Schoolhouse Heating and Ventilation," by William B. Ittner.
Paper: "Contribution of the Engineer to Comfort and Health in the School," by E. S. Hallett.

THURSDAY, JANUARY 27, 1:30 TO 4 P. M.

Research Session

Report of Committee on Research, H. P. Gant, chairman.
Report of the Director of Research, F. C. Houghten, director.
Technical papers by the research staff.

FRIDAY, JANUARY 28, 10:00 A. M.

Paper: "Concealed Radiation," by G. E. Otis.
Paper: "Turbulence and Heat Transfer," by L. G. Bousquet.
Paper: "Dehumidification Methods," by M. C. W. Tomlinson.
Installation of officers.
New Business.

New Method Proposed for Rating Low-Pressure Boilers

Announcement is made that a working plan has been adopted by the Technical Advisory Committee on Boiler Ratings of the American Society of Heating and Ventilating Engineers for the rating of low-pressure heating boilers. The committee has sent a letter to the boiler manufacturers of the country to learn if the industry really desires to have the unsatisfactory boiler rating condition cleared up and a uniform standard of rating established. From the results of this survey, the committee will draft a report to be presented, if possible, at the society's annual meeting in St. Louis.

As already announced, the committee is made up of Alfred S. Kellogg, Boston, chairman; Percy Nicholls, fuel engineer, U. S. Bureau of Mines, Pittsburgh; L. E. Seeley, Sheffield Scientific School, Yale University, New Haven, Conn., and F. C. Houghten, director of the A.S.H.V.E. Research Laboratory, Pittsburgh.

New York Chapter Learns About Paramount Building

Air conditioning in the Paramount Theatre occupied the entire program of the New York Chapter's December meeting, held at the Building Trades Club, New York, December 13.

The talk was given by D. C. Lindsay, of the Carrier Engineering Company, Newark, N. J., this company having supplied the special air-conditioning apparatus and supervised the whole ventilating arrangement.

Mr. Lindsay first went over the general principles and features of design involved in the Carrier centrifugal refrigeration apparatus and led from this up to the general scheme of ventilation used in the most modern theatres of to-day.

The lecture was profusely illustrated with slides, and at the conclusion, a semi-transparent model of a typical theatre was shown, this model graphically illustrating the air flow and diffusion, by means of electric lights behind rotating glass cylinders. The turning of the cylinders, on which various stripes and designs were painted, caused shadows to move along the ducts and created the optical illusion of visualizing the air movement, as well as the operation of the machinery.

This model is the same one exhibited at the New York Power Show during the week of December 6-11.

Massachusetts Chapter Holds an "If-I-Were" Meeting

An innovation in the form of an "If-I-Were" meeting was staged by the Massachusetts Chapter at its December session, held at the Engineers' Club, Boston, November 22. The speakers and their subjects were: Allen Hubbard, "If I Were the Heating Contractor"; Edward Moreland, "If I Were the Salesman"; Frank A. Merrill, "If I Were the Salesman"; Edgar Shaw, "If I Were the Engineer"; Thomas McCoy, "If I Were the Contractor," and William Jones, "If I Were the Engineer."

Mr. Jones, of Barnes & Jones, spoke straight from the shoulder and told the engineers of numerous rough spots in their specifications that worked a hardship on the successful bidder.

Edgar Shaw, a contractor, got in a few hot shots at the engineer and

quoted an instance where "a bent coupling" was specified instead of an elbow.

Mr. Hubbard, having been a contractor in his earlier career, was well qualified to talk on his subject, "If I Were the Heating Contractor."

Frank A. Merrill, of the Merrill Company, expressed his favorable opinion of heating and ventilating salesmen as a whole and called especial attention to the evolution now going on within the heating industry, both as to manufacturing and selling methods. He emphasized the importance to manufacturers of watching the trend and shaping themselves to the new angle of competition that is about to arrive within the industry.

Thomas McCoy, of the Powers Regulator Company, who spoke on "If I Were the Contractor," took the viewpoint of the salesmen. He showed the many ways in which the contractor could make it easier for the salesmen and at the same time make his own business road smoother.

Edward Moreland, a consulting engineer, told what he would do "If I Were the Salesman." His outstanding criticism of salesmen was that few had a thorough knowledge of the apparatus or appliances they were selling.

James A. Donnelly, of New York, who recently returned from the Research Laboratory, Pittsburgh, gave some interesting information regarding the work of the laboratory.

The meeting was well attended and the hearty applause given each speaker evidenced the keen interest in the discussions.

Minnesota Chapter

F. C. Houghten, director of the A.S.H. & V.E. Research Laboratory at Pittsburgh, addressed the Minnesota Chapter at its monthly meeting, held December 15, at the Men's Union, University of Minnesota, Mr. Houghten discussed various developments at the laboratory, including, in detail, a description of the heat meter and its operation.

St. Louis Chapter

Officers nominated for the St. Louis chapter for 1927, consist of: President, R. K. Milward of the U. S. Radiator Corporation; first vice-president, A. E. Humphries, O'Mara Heating Company; second vice-president, E. S. Hallett, St. Louis Board of Education; treasurer, E. H. Quentin, Johnson Heat Regulator Company; secretary, C. G. Buder, Donk Brothers Coal Company.

Michigan Chapter

Research work as conducted at the society's Research Laboratory was the subject of a talk delivered by F. C. Houghten, before the Michigan Chapter, at its December meeting.

The session was held December 13 at the Detroit Engineering Society's club house. Preceding the address by Mr. Houghten, a short talk was given by P. E. Fansler on what the department of public relations is doing.

Illinois Chapter Discusses Standardization

"Certified Heating" and the application of the engineering standards of The Heating and Piping Contractors National Association to this method was the subject of a paper presented by Harry M. Hart at the December meeting of the Illinois Chapter, held December 13 at the Hotel Sherman, Chicago. Mr. Hart was followed by Louis Braun, secretary of the local master steamfitters' association, who told of the activities of that organization in the certified heating movement and just what certified heating means to the owner of small buildings.

New members elected were Roger E. Kilby, W. M. Brayton, T. D. Bennett, S. M. Trumbo and Stanley B. Kitch.

The chapter voted to subscribe $100 to the Near East Relief Fund.

Pittsburgh Chapter

"Building Insulation" was the subject of a debate at the regular monthly meeting of the Pittsburgh Chapter, held November 8. After the transaction of routine business, E. C. Lloyd, chief engineer of the Armstrong Cork Company, was introduced.

Mr. Lloyd's remarks were particularly directed along the lines of house insulation as affecting the heating requirements.

At the December meeting "Co-operative work between the U. S. Public Health Service and the society in the Rochester Public Schools" was the subject discussed. This meeting was held at the U. S. Bureau of Mines, the speakers of the evening being President W. H. Driscoll and Professor Dibble.

The program for coming meetings in January and February was announced, the subject for January being "Dry Air Filters" and that for February being "Temperature Regulation."

A. S. M. E. Holds Annual Meeting

New officers elected at the forty-seventh annual meeting of the American Society of Mechanical Engineers, held in New York in December, are as follows: Charles M. Schwab, president; Everett O. Eastwood, Charles L. Newcomb, Edward R. Fish, vice-presidents; and Ralph M. Flanders, Conrad L. Lauer and Paul Doty, managers.

The social program of the meeting closely followed the procedure of the last two years and included an open-house gathering in the Engineering Societies Building, with a farcical investigation of an imaginary boiler explosion.

Elmer Sperry was presented with the John Fritz medal for his work in developing the Sperry gyro-compass and application of the gyroscope. Another award was the John Scott medal which was presented to Admiral Ralph Earle, president of the Worcester Polytechnic Institute, and formerly chief of the Bureau of Ordnance, for his invention of the 14-in. naval gun mounts and the mine barrage across the North Sea, during the war. This medal also carries a cash prize of $1000.

Five-minute safety talks were given at each of the technical sessions.

Several excursions and inspection trips were made by the members attending, including a visit to the Kips Bay Station of the New York Steam Company, the East River Station of the New York Edison Company, and the Harrison Gas Plant of the Public Service Company of New Jersey.

Other trips consisted of an inspection of the Holland Vehicular Tunnel, the Hudson Avenue Station of the Brooklyn Edison Company, the Hell Gate Station of the United Electric Light and Power Company, and of the plant of the De La Vergne Machine Company.

Recent developments in the utilization of coal occupied an important place on the program, a whole session being devoted to the processes of by-producting coal.

Home Building Campaign Launched by New Jersey Building Supply Men

The New Jersey Lumbermen's Association, combined with building supply men and others engaged in the building materials industry, have decided to get behind a "Build a Home First" movement that it is expected will have a far-reaching effect.

At a combined meeting held at Newark, N. J., November 30, for all those interested in building materials, a movement was begun to unite for the purpose of showing a solid front to combat the growing tendency to overvalue the consumer's dollar to the detriment of the building material business.

The idea of this combination of the building trades industry is to stimulate home building, and after this to use its endeavors to see that the homes built use a good character of material.

Advertising the slogan will be started by displaying the motto on the trucks operating in the industry, and Edward Hamilton, president of the New Jersey Lumber Dealers' Association, prophesied that by this means, in less than a week a million people will have seen the slogan.

Opposing Viewpoints in the School Ventilation Controversy

A Play in One Act

By George Truman Palmer, Dr. P. H.

THE open-window agitation has its bright spots. The sketch here reproduced was presented in the form of a paper at the recent annual meeting of the American Public Health Association, in Buffalo. It describes a scene from an imaginary drama, entitled "School Ventilation."

The sketch is intended to represent a typical dialogue between an advocate of a window-gravity ventilating system and an advocate of a mechanical ventilating system.

TIME, *the present.*

SCENE, *lounge of a city club.*

CAST, *window-gravity ventilation advocate and mechanical ventilation advocate.*

WINDOW-GRAVITY ADVOCATE (with vehemence): I tell you that the existing ventilation laws are tyrannical. They prohibit window-gravity ventilation. Why not prohibit open air schools? Why not compel tuberculosis sanatoria to close their windows and treat their patients with 30 cu. ft? As it is now, a child has to be sick to get into an open window room.

MECHANICAL VENTILATION ADVOCATE (soothingly): I am not in sympathy with tyrannical laws, but you must think twice before repealing ventilation laws. It was a long, hard pull to get those laws enacted. There has been a lot of improvement under those laws. Better not repeal them until you are dead sure that you can specify something better.

The advantage of mechanical ventilation is that it is subject to control. Window ventilation is at the mercy of the weather.

WINDOW-GRAVITY ADVOCATE (warming to the fray): I am not so sure about this control business. Window ventilation is controllable. The direct heat is controlled either automatically or manually. Air flow is controlled by the windows. And the power to control it is in the hands of the people affected. If fan ventilation is subject to so much better control why all the complaints against overheating? Why all the opened windows in fan ventilated rooms? Theoretically fan ventilation may be under control. Quite so, but what good is the control if it fails to make schoolrooms comfortable?

MECHANICAL VENTILATION ADVOCATE (with finality): It is unfair to expect a busy teacher to watch thermometers and open and close windows. Mechanical ventilation relieves her of all this worry. Window ventilation subjects the children in the outside aisle to icy draughts from the windows or extreme heat from the oversize radiators.

WINDOW-GRAVITY ADVOCATE (with asperity): Now, see here, you are not fair to window-gravity ventilation. You talk just like a recent article written by a former president of the American Society of Heating and Ventilating Engineers. Look at this picture with the article (holds picture aloft). It is supposed to represent the type of window ventilation advocated by the American Public Health Association and the New York State Commission on Ventilation. There are no less than six misrepresentations visible in the picture.

This window is open at the top.

The Ventilation Commission Report specifically taboos the top opening (see Page 522).

This window is closed at the bottom.

The report specifies opening at the bottom.

There is no deflector at the window.

The report specifies a deflector.

There is no shield in front of the radiator.

The report recommends such a shield.

The picture does not show automatic heat control, nor modulated hand control, nor a conveniently located radiator valve.

And yet the report specifies these things.

Incidentally, when you picture a schoolroom, never have the light coming in on the right side of the pupils and, further, always put some shades on the windows.

The title of this article is "Half Knowledge Is Dangerous in Ventilation." I must confess that this title is superbly appropriate.

MECHANICAL VENTILATION ADVOCATE (superciliously): Well, I don't know that the engineers have any particular monopoly on exaggeration or misstatement. It seems to me I have read expressions about "canned air" and "God's free air." You must realize that air is not free even when it comes in the windows. It costs money to move air, whether you move it by heat or by electricity.

WINDOW-GRAVITY ADVOCATE (disdainfully): Costs money? Don't talk about cost.

Window-gravity ventilation is not only less costly to install, but is cheaper to operate. McLure has shown that mechanical ventilation and indirect heating with individual ducts costs 50% more than window-gravity ventilation to install. Furthermore, even after you install it, experience shows that mechanical ventilation is not operated outside the heating season in the majority of cities. In many instances, it is not operated even during the heating season except on days of extreme cold. In some instances, ventilation systems are not operated at all, and have not been for several years. The reason they have not been operated is the high cost of operation. I am told, that for every four pounds of coal burned, only one is for heat, the other three for ventilating, on the 30 cubic foot basis.

MECHANICAL VENTILATION ADVOCATE (searchingly): In advocating window-gravity ventilation, the New York Commission report recommends extra radiation, larger exhaust ducts, larger space allowance per pupil, and suggests that the leeward exposure of the building is not suitable for window ventilation.

How do you figure that window ventilation is less expensive when the building must be enlarged, the radiation increased, the vent ducts more than doubled, and all the rooms on one side of the building tabooed for school use?

(Triumphantly) Look here! Did you ever design or build a ventilating system?

WINDOW-GRAVITY ADVOCATE (somewhat abashed): No, I can't say that I ever did (with rising courage), but I have spent considerable time inside of school buildings.

Were you ever in one of the newer types of window-gravity schools? Did you ever sit down in one of these schoolrooms for an hour or more and actually experience the sensation of window-gravity ventilation?

MECHANICAL VENTILATION ADVOCATE (hesitatingly): No, I don't know that I have.

WINDOW-GRAVITY ADVOCATE (sarcastically): Don't you think you could discuss the matter with better grace if you had a little more knowledge of the life within a schoolroom?

The New York State Commission found that there was less respiratory disease in window ventilated rooms.

MECHANICAL VENTILATION ADVOCATE (skeptically): That doesn't convince me. The buildings that were chosen to represent mechanical ventilation were old models. Besides, a number of years ago, the Detroit Board of Education found that the window ventilated room was impossible and had more disease than the mechanically ventilated room.

WINDOW-GRAVITY ADVOCATE (aggres-

sively): The Detroit study is not at all contradictory. The window rooms in the Detroit study were not window-gravity ventilation. In the first place, the gravity exhaust ducts were closed, the windows were covered full length with muslin screens, and the rooms had a great excess of direct radiation all on one thermostat. The result of the Detroit study is exactly what one would expect and is confirmed by studies on this type of room by the New York Commission.

Another thing, the schools in the New York study were not all old schools. They were representative of the time, and three buildings were of the very latest pattern and had just been opened.

It seems to me you always have excuses for the mechanically ventilated buildings that are studied.

The perfect building is always the one that you, but no one else, has visited.

MECHANICAL VENTILATION ADVOCATE (splashing about wildly): The trouble with the New York Commission is that they took a lot of data based on opinion. They had no scientific basis. They had no readings or facts to support their opinions.

WINDOW-GRAVITY ADVOCATE (with heat, holding up report of New York Ventilation Commission): Here are 200 pages of reading and facts. Why not look at them?

MECHANICAL VENTILATION ADVOCATE (stubbornly): The work was not scientific.

WINDOW-GRAVITY ADVOCATE (patronizing, yet with earnestness): And yet 5 of the 6 members of the New York Commission are listed in American Men of Science, whereas I failed to find a single name representing the prominent critics of window ventilation.

(In best scientific manner): Is there not much more probability of attacking a problem without bias when 6 men are chosen from 6 different professional fields—education, medicine, chemical biology, public health, ventilating engineering, and physiology—and each representative eminent in his field? Is not this better than a commission of all physicians, or all engineers?

MECHANICAL VENTILATION ADVOCATE (with dying gasp): H'm, you've got to be practical as well as scientific.

WINDOW-GRAVITY ADVOCATE (defeated, yet still hopeful): Well, what shall we do about it?

MECHANICAL VENTILATION ADVOCATE: Er-r-r (as one inspired) we might refer it to a committee.

WINDOW-GRAVITY ADVOCATE (thrilled with anticipation): By Jove, that's a happy solution. Shake.

CURTAIN.

Bureau of Standards Celebrates Twenty-Fifth Anniversary

A dinner commemorating the twenty-fifth anniversary of the establishment of the Bureau of Standards was held on December 4 at the New Willard Hotel, Washington, D. C.

Speeches in honor of the occasion were delivered by Dr. George K. Burgess, toastmaster, Herbert Hoover, Robert B. Howell, Dr. Frank A. Wolff, George B. Cortelyou, William B. Oliver and Dr. S. W. Stratton.

About 1500 persons visited the bureau during the day, while it was open for inspection.

George A. Brown Appointed Eastern Advertising Representative of The Heating and Ventilating Magazine

George A. Brown, until recently with *The Constructor*, the national publication of The Associated General Contractors of America, in the capacity of eastern manager, has joined the staff of THE HEATING AND VENTILATING MAGAZINE as eastern advertising representative.

Mr. Brown brings to his new post a wide and valuable experience, including advertising and journalistic work in the

George A. Brown,
Eastern Representative of The Heating and Ventilating Magazine

newspaper, magazine and business paper fields where he has specialized in representing publications in the industrial, mechanical and engineering group.

Mr. Brown entered upon his new work January 1.

Exhibitors at Heating and Ventilating Show to Share in Profits

According to an announcement issued under the authority of the Allied Heating and Ventilating Exhibitors' Association, all who exhibit in the second national heating and ventilating exposition, to be held at the Twelfth Regiment Armory, New York, March 14-19, 1927, will share in the profits resulting from this show to the extent of 40%. Those taking space will share pro rata, according to the amount paid for the booths.

The same announcement states that over 50 booths have already been reserved.

The Relation Between Smoke and Pneumonia

That there is apparently a close relation between smoke and pneumonia was the assertion made by Dr. William Charles White, pathologist of the U. S. Public Health Service, in an address made to members of the Fuels Division of the A.S.M.E. at its forty-seventh annual meeting, held in the Engineering Societies Building, New York, December 7. He suggested that an experiment should be carried out to determine this question definitely, and mentioned Pittsburgh as a proposed location in which to center the experimental work.

Dr. White, who is the chairman of the Medical Research Committee of the National Tuberculosis Association, stated that it was time to inaugurate a practical step toward sweeping away doubt as to the relation of smoke and disease He was of the opinion that the properly correlated agencies should join with the city of Pittsburgh in a co-operative plan of research.

Pittsburgh has a low tuberculosis death rate, year after year, but, on the other hand, has the highest constant pneumonia death rate of any community in the world. Analyzing the city by wards, he explained, it became clearer that the denser the smoke content in the air the higher the pneumonia death rate. But such density apparently bears no relation to tuberculosis, taken by wards.

If one could reason safely from this study," Dr. White continued, "he would say that smoke has no influence on tuberculosis, but has a tremendous influence on acute lung diseases. This is probably near the truth, but we have not yet enough evidence to make such a statement.

"An analysis by the United States Public Health Service indicates that there is an industrial health hazard in work in the steel mills, which has a definite relation to the high pneumonia mortality in Pittsburgh."

STEAMING TESTS WITH INDIANA COAL are presented in a bulletin published by the Engineering Experiment Station of Purdue University, Lafayette, Ind., known as Bulletin No. 26. This is a collection of the data from a large number of tests on the amount of steam produced per pound of fuel burned, the tests being based on various grades of Indiana coal when fired under various designs of heating apparatus and with the common and simple types of grates, as well as the more highly-developed makes of stokers. Size 6 x 9 in. Pp. 199.

Warm-Air Furnaces Being Rated by New Formula

National Association Adopts Formula of Professor Willard, and Manufacturers Agree to Accept Such Ratings as Standard

THE adoption of a formula for rating warm-air furnaces was the most important feature of the meeting of the National Warm Air Heating and Ventilating Association held in Urbana, December 1-3. In order that real benefit accrue to the industry through the application of the formula, the association decided to appoint a qualified technical man to visit the member manufacturers and officially determine the ratings of all furnaces now marketed. The manufacturers agreed to accept the ratings thus obtained and to use nothing else in their literature or sales attempts.

The frank and dispassionate talk by L. Wayne Arny, director of public relations, brought the association face to face with a condition of instability within the industry that even the most optimistic agreed must be remedied before a general selling campaign could be instituted with satisfactory results. Mr. Arny stated plainly that the conditions within the industry, both as to sales and installations were chaotic, and that, until the manufacturer could guarantee the proper installation of his product, he should not extend his present sales efforts.

Naturally this brought on a vigorous discussion, but Mr. Arny was armed with facts and examples to show that, in general, the manufacturer was interested mainly in a tonnage output, and neglected to take the necessary steps to insure the customer getting the best possible installation.

The consensus of opinion following the discussion was that the members of the association should develop methods of eliminating these internal difficulties before the association launched into a nation-wide campaign directed to the consumer.

THE FURNACE RATING FORMULA

The formula developed by Professor A. C. Willard is as follows:

$$L = 1.75\ G\ [1 + 0.02\ (R - 20)]$$

in which L is the total leader area for the house, and G is the gross grate area, both expressed in square inches, and R equals heating surface divided by grate surface.

To apply this formula it will be necessary to have the value R, and this will be obtained as follows:

1. Have furnaces measured for heating surface and grate surface by reliable, disinterested party.

2. Party to be elected by advisory committee plus Professor Willard.

3. Party to be trained by and report results of measurements to Professor Willard.

4. Party to be paid from general fund in hand of society treasurer.

5. Member firms to be charged for services of party making measurements at the rate of $10.00 per day plus expenses.

6. Data, heating surface and grate surface, when OK'd by research staff, is to be given to the company for use by said company, and shall also be filed with this research staff.

7. Each furnace measured and OK'd to be properly labeled under the authority of the association as follows:

No. of furnace .....
Heating surface .....
Grate surface .....

8. Manufacturers, not member companies, will not be eligible to authorized measurement.

9. When furnaces are measured a list will be published by the society and distributed with the Standard Code.

The Power Show a Wonderful Exhibit

THE Fifth National Exposition of Power and Mechanical Engineering, popularly known as the "Power Show," came to a close December 11, after a most encouraging week of exhibition. Numbering over 480 exhibits, the show was one which had to be seen to be fully appreciated.

Exhibits of heating and ventilating apparatus were somewhat submerged in a show already carrying a world of interesting and instructive displays in the power and high-pressure field.

Visitors had some difficulty in locating the heating and ventilating equipment in a show of such magnitude, occupying, as it did, four floors of the Grand Central Palace.

The management did all that was possible to assist the vistor by displaying near the front entrance a large guide board of the exhibitors and the location of their booths. On this board were listed, separately, the names of the manufacturers of heating and ventilating equipment. In several instances, however, the exhibitors so listed were found to be displaying their high-pressure equipment, in preference to their heating and ventilating products.

Two displays, which attracted particular interest in the heating and ventilating field, were a model of theater ventilation and air cooling, which was a masterpiece of ingenuity, and a miniature boiler and low-pressure heating plant complete with piping and vapor specialties. Air filters, with complete oil flow, were shown in operation, while other exhibits included air washers, unit heaters, unit ventilators, radiator valves, thermostatic traps and several pipe valve and pipe exhibits.

Included in the list of exhibitors, under the designation of "heating and ventilation," were the following:

Alexander Brothers
American Blower Co.
American Foundry Equipment Co.
American Pipe Bending Machine Co.
American Machine and Foundry Co.
American Schaeffer and Budenberg Corp.
Armstrong Cork and Insulation Co.
Arca Regulators Co.
Ashton Valve Co.
Ashcroft Mfg. Co.
Atlas Valve Co.
Atwood and Merrill Co.
Babbitt Steam Specialty Co.
Badger, E. B. & Sons Co.
Bailey Meter Co.
Barnes & Jones
Bigelow, L. C., Co.
Boiler Engineering Co.
Botfield Refractories Co.
Bristol Co.
Borden Co., The
Bundy Steam Trap Co.
Buffalo Forge Co.
Buffalo Steam Pump Co.
Byers, A. M., Co.
Carling Turbine Blower Co.
Carrier Engineering Corp.
Cash, A. W., Co.
Casey-Hedges Co.
Clarage Fan Co.
Continental Valve & Equipment Co.
Cochrane Corp.
Coffin Valve Co.
Cooling Tower Co.
Cork Foundation Co.
Crane Co.
Crosby Steam Gage & Valve Co.
Curtis & Curtis Co.
Davidson, M. T., Co.
Davis Engineering Co.
Davis, G. M., Regulator Co
Dickson, Walter S. & Co.
Drying Systems, Inc.
Eastern Steam Specialty Co.
Edward Valve & Mfg. Co.
Ellison, Lewis M.
Fairbanks Morse Co.
Federal Gauge Co.
Fisher Governor Co.
Foster Engineering Co.
Foxboro Co.
Fulton Co.
General Electric Co.
Gillis & Geoghegan, Inc.
Griscom-Russell Co.
Hoffman Specialty Co.
Ilg Electric Ventilating Co.
Illinois Engineering Co.
Insulating Products Corp.
Instant Water Heater Co.
Jenkins Bros.
Johns-Manville, Inc.
Johnson Service Co.
Keating, E. F., Pipe Bending Supply Co.
Keeler, E., Co.
Kieley & Mueller, Inc.
Korfund Co.
Marcon Regulator Co.
Mason Regulator Co.
Midwest Air Filters, Inc.
Midwest Piping & Supply Co.
Moto Meter Co.
Nash Engineering Co.
National Air Filter Co.
National Tube Co.
Neemes Foundry, Inc.
Peerless Ventilator Co.
Pittsburgh Piping & Equipment Co.
Powell, William, Co.
Preferred Utilities Co., Inc.
Pyramid Iron Products Corp.
Reed Air Filter Co.
Reliance Gauge Column Co.
Reliance Electric & Engineering Co.
Sarco Co., Inc.
Schutte & Koerting
Sherman, V. L. (Isometric Pipe Layouts)
Skidmore Corp.
Spencer Turbine Co.
Spray Engineering Co.
Sturtevant, B. F., Co.
Swartwout Co.
Tagliabue, C. J., Mfg. Co.
Taylor Instrument Companies
Uehling Instrument Co.
Walworth Co.
Warren Webster & Co.
Westinghouse Electric & Mfg. Co.
Wheeler Condenser & Engineering Co.
Wing, L. J., Mfg. Co.
Wright-Austin Co.
"X" Laboratories

INFILTRATION

Stationary Wood Sash	25	French Doors	100
Double Hung Wood Sash	50	Outside Doors	200
Double Hung Steel Sash	100	Outside Doors with Storm Doors	100
Casement Windows	100	Outside Doors with	
Fenestra	100	Inner Vestibule Doors	100

Metal Weather Strip Deducts 50%

HEATING AND PIPING CONTR

STANDARD RADIAT

SHOWING RADIATION REQU

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3 Col 38" St'm Rad	GLASS		INFILTRATION				OUTSIDE WALL													
	Win. or Door	Sky Light	Rate per Lin. Ft.				Plain Brick			Brick and Pl.			Brick Fur. L. P.			Br. 4" Tile Pl.			Plain Con	
			25	50	100	200	8"	12"	16"	8"	12"	16"	8"	12"	16"	4"	8"	12"	8"	12"
	1.1	1.3	0.45	0.9	1.8	3.6	.42	.32	.26	.38	.29	.25	.27	.23	.21	.30	.26	.22	.60	.48
225	66.0	78.0	27.0	54.0	108	216	25.2	19.2	15.6	22.8	17.4	15.0	16.2	13.8	12.6	18.0	15.6	13.2	36.0	28.8
1	3.41	2.89	8.34	4.17	2.08	1.04	8.93	11.7	14.4	9.9	12.9	15.0	13.9	16.2	17.9	12.5	14.4	17.0	6.25	7.82
2	6.82	5.78	16.7	8.34	4.16	2.08	17.9	23.4	28.8	19.8	25.8	30.0	27.8	32.4	35.8	25.0	28.8	34.0	12.5	15.6
3	10.2	8.67	25.0	12.5	6.24	3.12	26.8	35.1	43.2	29.7	38.7	45.0	41.7	48.6	53.7	37.5	43.2	51.0	18.8	23.5
4	13.6	11.6	33.4	16.7	8.32	4.16	35.7	46.8	58.6	39.6	51.6	60.0	55.6	64.8	71.6	50.0	57.6	68.0	25.0	31.3
5	17.1	14.5	41.7	20.8	10.4	5.20	44.7	58.5	72.0	49.5	64.5	75.0	69.5	81.0	89.5	62.5	72.0	85.0	31.3	39.1
6	20.5	17.3	50.0	25.0	12.5	6.24	53.6	70.2	86.4	59.4	77.4	90.0	83.4	97.2	107	75.0	86.4	102	37.5	47.0
7	23.9	20.2	58.4	29.2	14.6	7.28	62.5	81.9	101	69.3	90.3	105	97.3	113	125	87.5	101	119	43.8	54.7
8	27.3	23.1	66.7	33.4	16.6	8.32	71.4	93.6	115	79.2	103	120	111	130	143	100	115	136	50.0	62.6
9	30.7	26.0	75.1	37.6	18.7	9.36	80.4	105	130	89.1	116	135	125	146	161	113	130	153	56.3	70.4
10	34.1	29.0	83.4	41.7	20.8	10.4	89.3	117	144	99.0	129	150	139	162	179	125	144	170	62.6	78.2
11	37.6	31.8	91.8	45.9	22.9	11.4	98.2	129	158	109	142	165	153	178	197	138	158	187	68.8	86.0
12	40.9	34.7	100	50.0	25.0	12.5	107	140	173	119	155	180	167	194	215	150	173	204	75.0	93.8
13	44.3	37.6	108	54.2	27.0	13.5	116	152	187	129	168	195	181	211	233	163	187	221	81.3	102
14	47.7	40.5	117	58.4	29.1	14.6	125	164	202	139	181	210	195	227	251	175	202	238	87.5	109
15	51.2	43.4	125	62.6	31.2	15.6	134	176	216	149	194	225	209	243	269	188	216	255	93.8	117
16	54.6	46.2	133	66.7	33.3	16.6	143	187	230	158	206	240	222	259	286	200	230	272	100	125
17	58.0	49.1	142	70.9	35.4	17.7	152	199	245	168	219	255	236	275	304	213	245	289	106	133
18	61.4	52.0	150	75.1	37.4	18.7	161	211	259	178	232	270	250	292	322	225	259	306	113	141
19	64.8	54.9	158	79.2	39.5	19.7	170	222	274	188	245	285	264	308	340	238	274	323	119	149
20	68.2	57.8	167	83.4	41.6	20.8	179	234	288	198	258	300	278	324	358	250	288	340	125	156
21	71.6	60.7	175	87.6	43.7	21.8	187	246	302	208	271	315	292	340	376	263	302	357	131	164
22	75.0	63.6	183	91.7	45.8	22.9	196	257	317	218	284	330	306	356	394	275	317	374	138	172
23	78.4	66.5	192	96.0	47.8	23.9	205	269	331	228	297	345	320	373	412	288	331	391	144	180
24	81.8	69.4	200	100	49.9	25.0	214	281	346	238	310	360	334	389	430	300	346	408	150	188
25	85.3	72.3	209	104	52.0	26.0	223	293	360	248	323	375	348	405	448	313	360	425	156	196

For Methods of Using Table See Back of Sheet.

INFILTRATION

Stationary Wood Sash	25	French Doors	100
Double Hung Wood Sash	50	Outside Doors	200
Double Hung Steel Sash	100	Outside Doors with Storm Doors	100
Casement Windows	100	Outside Doors with	
Fenestra	100	Inner Vestibule Doors	100

Metal Weather Strip Deducts 50%

HEATING AND PIPING CONTR

STANDARD RADIAT

SHOWING RADIATION REQU

Copyright 1924, by Heating and Piping Contractors National Association. For Othe

3 Col 38" St'm Rad	GLASS		INFILTRATION				OUTSIDE WALL													
	Win. or Door	Sky Light	Rate per Lin. Ft.				Plain Brick			Brick and Pl.			Brick Fur. L. P.			Br. 4" Tile Pl.			Plain Con	
			25	50	100	200	8"	12"	16"	8"	12"	16"	8"	12"	16"	4"	8"	12"	8"	12"
	1.1	1.3	0.45	0.9	1.8	3 6	42	32	26	.38	.29	.25	.27	.23	.21	.30	.26	.22	60	.48
225	71.5	84.5	29.3	58.5	117	23.4	27.3	20.8	16.9	24.7	18.8	16.2	17.5	14.9	13.6	19.5	16.9	14.3	39.0	31.2
1	3.12	2.66	7.66	3.84	1.92	.96	8.25	10.8	13.31	9.11	11.9	13.8	12.8	15.05	16.5	11.5	13.3	15.7	5.77	7.21
2	6.24	5.32	15.3	7.68	3.84	1.92	16.5	21.6	26.6	18.2	23.8	27.7	25.7	30.1	33.0	23.0	26.7	31.4	11.5	14.4
3	9.36	7.98	22.9	11.5	5.76	2.88	24.7	32.4	39.9	27.3	35.8	41.5	38.5	45.1	49.5	34.5	40.0	47.1	17.3	21.6
4	12.4	10.6	30.6	15.3	7.68	3.84	33.0	43.2	53.2	36.4	47.7	55.4	51.4	60.2	66.0	46.0	53.4	62.8	23.0	28.8
5	15.6	13.3	38.3	19.2	9.6	4.82	41.2	54.0	66.5	45.5	59.7	69.2	64.2	75.2	82.5	57.5	66.7	78.5	28.8	36.0
6	18.7	15.9	45.9	23.0	11.5	5.7	49.5	64.8	79.8	54.6	71.6	83.1	77.1	90.3	99.0	69.0	80.1	94.2	34.6	43.2
7	21.8	18.6	53.6	26.8	13.4	6.72	57.7	75.6	93.1	63.7	83.5	96.9	89.9	105	115	80.5	93.4	110	40.3	50.4
8	24.9	21.2	61.2	30.7	15.3	7.68	66.0	86.4	106	72.8	95.5	110	102	120	132	92.0	106	126	46.1	57.6
9	28.0	23.9	68.9	34.5	17.2	8.64	74.2	97.2	119	81.9	107	124	116	135	148	103	120	141	51.9	64.8
10	31.2	26.6	76.6	38.4	19.2	9.60	82.5	108	133	91.7	119	138	128	150	165	115	133	157	57.7	72.1
11	34.3	29.2	84.2	42.2	21 1	10.5	90.7	118	146	100	131	152	141	165	181	126	146	173	63.4	79.3
12	37.4	31.9	91.9	46.0	23.0	11.5	99.0	129	159	109	143	166	154	180	198	138	160	188	69.2	86.5
13	40.6	34.5	99.5	49.9	24.9	12.4	107	140	173	118	155	180	167	195	214	149	173	204	75.0	93.7
14	43.6	37.2	107	53.7	26.8	13.4	115	151	186	127	167	193	179	210	231	161	186	220	80.7	100
15	46.8	39.9	114	57.6	28.8	14.4	123	162	199	136	179	207	192	225	247	172	200	236	86.5	108
16	49.9	42.5	122	61.4	30.7	15.3	132	172	212	145	191	221	206	240	264	184	213	251	92.3	115
17	53.0	45.2	130	65.2	32.6	16.3	140	183	226	154	202	235	218	255	280	195	226	267	98.0	122
18	56.1	47.8	137	69.1	34.5	17.2	148	194	239	163	214	249	231	270	297	207	240	283	103	129
19	59.2	50.5	145	72.9	36.4	18.2	156	205	252	173	226	263	244	285	313	218	253	298	109	136
20	62.4	53.2	153	76.8	38.5	19.2	165	216	266	182	238	277	257	301	330	230	267	314	115	144
21	65.5	55.8	160	80.6	40.4	20.1	173	227	279	191	250	290	269	316	346	241	280	330	121	151
22	68.6	58.5	168	84.4	42.3	21 1	181	237	292	200	262	304	282	331	363	253	293	345	126	158
23	71 7	61 1	176	88 3	44.2	22.0	189	248	305	209	274	318	295	346	379	264	307	361	132	165
24	74.8	63.8	183	92.1	46.1	23.0	198	259	319	218	286	332	308	361	396	276	320	377	138	173
25	78 0	66 5	191	96 0	48 0	24 0	206	270	332	227	298	346	321	376	412	287	333	392	144	180

IPING CONTRACTORS NATIONAL ASSOCIA

ANDARD RADIATION ESTIMATING TABLE

G RADIATION REQUIRED FOR QUANTITIES INDICATED

nal Association. For Other Construction than that Shown SeeHeating and Piping Contractors National Associatio

D E	W A L L S												ROOF		
r. 4" Tile Pl.			Plain Conc.			Conc. Fur L. P.			Frame Std.	Frame No Sh'g	Frame No L. P.	T&G on 1" Bd.	T&G on 4" Conc.	Sh'gle on Sh'g
	8"	12"	8"	12"	16"	8"	12"	16"						
)	.26	.22	.60	.48	.41	.50	.40	.34	.24	.31	.35	.30	.60	.40
0	15.6	13.2	36.0	28.8	24.6	30.0	24.0	20.4	14.4	18.6	21.0	18.0	36.0	24.0
5	14.4	17.0	6.25	7.82	9.15	7.5	9.38	11.0	15.6	12.1	10.7	12.5	6.25	9.38
0	28.8	34.0	12.5	15.6	18.3	15.0	18.8	22.0	31.2	24.2	21.4	25.0	12.5	18.8
5	43.2	51.0	18.8	23.5	27.5	22.5	28.1	33.0	46.8	36.3	32.1	37.5	18.8	28.1
0	57.6	68.0	25.0	31.3	36.6	30.0	37.5	44.0	62.4	48.4	42.8	50.0	25.0	37.5
5	72.0	85.0	31.3	39.1	45.8	37.5	46.9	55.0	78.0	60.5	53.5	62.5	31.3	46.9
0	86.4	102	37.5	47.0	54.9	45.0	56.3	66.0	93.6	72.6	64.2	75.0	37.5	56.3
5	101	119	43.8	54.7	64.1	52.5	65.7	77.0	109	84.7	74.9	87.5	43.8	65.7
0	115	136	50.0	62.6	73.2	60.0	75.0	88.0	125	96.8	85.6	100	50.0	75.0
3	130	153	56.3	70.4	82.4	67.5	84.4	99.0	140	109	96.3	113	56.3	84.4
5	144	170	62.6	78.2	91.5	75.0	93.8	110	156	121	107	125	62.6	93.8
8	158	187	68.8	86.0	101	82.5	103	121	172	133	118	138	68.8	103
0	173	204	75.0	93.8	110	90.0	113	132	187	145	128	150	75.0	113
3	187	221	81.3	102	119	97.5	122	143	203	157	139	163	81.3	122
5	202	238	87.5	109	128	105	131	154	218	169	150	175	87.5	131
8	216	255	93.8	117	137	113	141	165	234	182	161	188	93.8	141
0	230	272	100	125	146	120	150	176	250	194	171	200	100	150
3	245	289	106	133	156	128	159	187	265	206	182	213	106	159
5	259	306	113	141	165	135	169	198	281	218	193	225	113	169
8	274	323	119	149	174	143	178	209	296	230	203	238	119	178
0	288	340	125	156	183	150	188	220	312	242	214	250	125	188
3	302	357	131	164	192	158	197	231	328	254	225	263	131	197
5	317	374	138	172	201	165	206	242	343	266	235	275	138	206
8	331	391	144	180	210	173	216	253	359	278	246	288	144	216
0	346	408	150	188	220	180	225	264	374	290	257	300	150	225
3	360	425	156	196	229	188	235	275	390	303	268	313	156	235

IPING CONTRACTORS NATIONAL ASSOCIA

ANDARD RADIATION ESTIMATING TABLE

NG RADIATION REQUIRED FOR QUANTITIES INDICATED

al Association. For Other Construction than that Shown See Heating and Piping Contractors National Associati

D E	W A L L S												ROOF		
Br. 4" Tile Pl.			Plain Conc.			Conc. Fur L. P.			Frame Std.	Frame No Sh'g	Frame No L. P.	T&G on 1" Bd.	T&G on 4" Conc.	Sh'gl on Sh'g
"	8"	12"	8"	12"	16"	8"	12"	16"						
30	.26	.22	60	.48	.41	.50	.40	.34	.24	.31	.35	.30	.60	.40
9.5	16.9	14.3	39.0	31.2	26.6	32.5	26.0	22.1	15.6	20.1	22.7	19.5	39.0	26.
1.5	13.3	15.7	5.77	7.21	8.45	6.92	8.65	10.2	14.4	11.1	9.89	11.5	5.77	8.6
3.0	26.7	31.4	11.5	14.4	16.9	13.8	17.3	20.4	28.8	22.3	19.7	23.0	11.5	17.
4.5	40.0	47.1	17.3	21.6	25.3	20.7	25.9	30.6	43.2	33.4	29.6	34.5	17.3	25.
6.0	53.4	62.8	23.0	28.8	33.8	27.6	34.6	40.8	57.6	44.6	39.5	46.0	23.0	34.
7.5	66.7	78.5	28.8	36.0	42.2	34.6	43.2	51.1	72.0	55.8	49.4	57.5	28.8	43.
9.0	80.1	94.2	34.6	43.2	50.7	41.5	51.9	61.3	86.4	66.9	59.3	69.0	34.6	51.
0.5	93.4	110	40.3	50.4	59.1	48.4	60.5	71.5	100	78.1	69.2	80.5	40.3	60.
2.0	106	126	46.1	57.6	67.6	55.3	69.2	81.7	115	89.2	79.1	92.0	46.1	69.
103	120	141	51.9	64.8	76.0	62.2	77.8	91.9	129	100	89.0	103	51.9	77.
115	133	157	57.7	72.1	84.5	69.2	86.5	102	144	111	98.9	115	57.7	86.
126	146	173	63.4	79.3	92.9	76.1	95.1	112	158	122	108	126	63.4	95.
138	160	188	69.2	86.5	101	83.0	103	122	172	133	118	138	69.2	10
149	173	204	75.0	93.7	109	89.9	112	132	187	145	128	149	75.0	11
161	186	220	80.7	100	118	96.8	121	143	201	156	138	161	80.7	12
172	200	236	86.5	108	126	103	129	153	216	167	148	172	86.5	12
184	213	251	92.3	115	135	110	138	163	230	178	158	184	92.3	13
195	226	267	98.0	122	143	117	147	173	244	189	168	195	98.0	14
207	240	283	103	129	152	124	155	183	259	200	178	207	103	15
218	253	298	109	136	160	131	164	194	273	212	187	218	109	16
230	267	314	115	144	169	138	173	204	288	223	197	230	115	17
241	280	330	121	151	177	145	181	214	302	234	207	241	121	18
253	293	345	126	158	185	152	190	224	316	245	217	253	126	19
264	307	361	132	165	194	159	198	235	331	256	227	264	132	19
276	320	377	138	173	202	166	207	245	345	267	237	276	136	20
287	333	393	144	180	211	173	216	255	360	279	247	287	144	21

TION

on Engineering Standards.

EASTPORT, MAINE

TEMPERATURE FACTORS		EXPOSURE FACTORS			
Room Temperature	70°=T_1	N	1.45	S	1.00
Base Temperature	+10°=T_o	N E	1.20	S W	1.45
Base Temp. +10° Equivalent to		E	1.20	W	1.45
Guarantee Temp. of —5° Outside		S E	1.00	N W	1.45

		Base Floor		Interm'e Floor			Ceiling		Partition			Type
	Sh'gle Sh'g L. P.	Conc. on Earth	Wood on Sleep.	4" Conc.	4" Conc. 3" Fill 1" Fin.	Double Wood	Lath and Plas.	L & P Wo. Fl. Over	Stud L & P 1 Side	Stud L & P 2 Side		Kind
	.30	.31	.13	.20	.15	.20	.49	.28	.60	.33		K
	18.0	9.3	3.9	6.0	4.5	6.0	14.7	8.4	18.0	9.9		K(T1-To)
	12.5	24.2	57.7	37.5	50.0	37.5	15.3	26.8	12.5	22.7		1
	25.0	48.4	115	75.0	100	75.0	30.6	53.6	25.0	45.4		2
	37.5	72.6	173	113	150	113	45.9	80.4	37.5	68.1		3
	50.0	96.8	231	150	200	150	61.2	107	50.0	90.8		4
	62.5	121	289	188	250	188	76.5	134	62.5	114		5
	75.0	145	346	225	300	225	91.8	161	75.0	136		6
	87.5	169	404	263	350	263	107	188	87.5	159		7
	100	194	462	300	400	300	122	214	100	182		8
	113	218	519	338	450	338	138	241	113	204		9
	125	242	577	375	500	375	153	268	125	227		10
	138	266	635	413	550	413	168	295	138	250		11
	150	290	692	450	600	450	184	322	150	272		12
	163	315	750	488	650	488	199	348	163	295		13
	175	339	808	525	700	525	214	375	175	318		14
	188	363	866	563	750	563	230	402	188	341		15
	200	387	923	600	800	600	245	429	200	363		16
	213	411	981	638	850	638	260	456	213	386		17
	225	436	1039	675	900	675	275	482	225	409		18
	238	460	1096	713	950	713	291	509	238	431		19
	250	484	1154	750	1000	750	306	536	250	454		20
	263	508	1212	788	1050	788	321	563	263	477		21
	275	532	1269	825	1100	825	337	590	275	499		22
	288	557	1327	863	1150	863	352	616	288	522		23
	300	581	1385	900	1200	900	367	643	300	545		24
	313	605	1443	938	1250	938	383	670	313	568		25

←——These Items Figured on Basis of K $\left(\frac{T_1-T_2}{2}\right)$ ——→

TION

ion Engineering Standards.

MADISON, WIS.

TEMPERATURE FACTORS		EXPOSURE FACTORS			
Room Temperature	70°=T_1	N	1.25	S	1.10
Base Temperature	+5°=T_o	N E	1.15	S W	1.25
Base Temp. +5° Equivalent to		E	1.10	W	1.25
Guarantee Temp. of —10° Outside		S E	1.00	N W	1.25

		Base Floor		Interm'e Floor			Ceiling		Partition			Type
e	Sh'gle Sh'g L. P.	Conc. on Earth	Wood on Sleep.	4" Conc.	4" Conc. 3" Fill 1" Fin.	Double Wood	Lath and Plas.	L & P Wo. Fl. Over	Stud L & P 1 Side	Stud L & P 2 Side		Kind
)	.30	.31	.13	.20	.15	.20	.49	.28	.60	.33		K
0	19.5	10.8	4.23	6.5	4.87	6.5	15.9	9.1	19.5	10.7		K(T1-To)
5	11.5	20.8	53.0	34.6	46.2	34.6	14.1	24.6	11.5	21.0		1
3	23.0	41.6	106	69.2	92.4	69.2	28.2	49.4	23.0	42.0		2
9	34.5	62.4	159	103	139	103	42.2	74.0	34.6	63.0		3
6	46.0	83.2	212	138	185	138	56.4	106	46.0	84.0		4
2	57.5	104	264	173	231	173	70.4	123	57.6	105		5
9	69.0	125	318	207	277	207	84.6	148	69.2	125		6
5	80.5	145	370	242	323	242	98.6	172	80.6	146		7
2	92.0	166	424	276	369	276	112	197	92.2	167		8
8	103	187	476	311	416	311	126	222	103	188		9
5	115	208	530	346	462	346	141	246	115	208		10
1	126	229	582	380	508	380	155	270	126	230		11
3	138	250	636	414	554	414	169	294	138	250		12
2	149	270	688	449	600	449	183	320	150	272		13
1	161	291	742	484	646	484	197	344	161	292		14
9	172	312	794	518	683	518	210	370	173	314		15
8	184	333	848	553	739	553	224	394	184	334		16
7	195	354	900	588	785	588	238	419	196	356		17
5	207	375	954	622	832	622	252	444	206	375		18
4	218	395	1006	657	878	657	266	468	218	396		19
3	230	416	1060	692	924	692	282	494	230	418		20
1	241	437	1112	726	970	726	296	518	242	440		21
0	253	458	1166	760	1014	760	310	542	252	460		22
8	264	478	1218	795	1060	795	324	568	264	482		23
7	276	499	1272	830	1108	830	338	592	276	502		24
6	287	520	1324	864	1155	864	352	616	288	524		25

How to Use the Eastport, Me., Table

Figure from the plans the number of square feet of wall, glass and lineal feet of crack for each exposure. Find the nearest corresponding quantity in appropriate column. Then read horizontally to extreme right or left-hand column for square feet of radiation required. Add additional amount for exposure, as shown in upper right-hand square of data sheet.

For example, for Eastport, Me.: 70 sq. ft. of 12-in. brick wall. Read down the column headed "Plain brick, 12-in."; the figure in the table is 70.2. Following horizontally to extreme left or right shows about 6 sq. ft. of 38-in. 3-col. radiation. If wall faces north, multiply by 1.45, making 8.7 sq. ft. actually required.

If same wall has 30 sq. ft. of glass or door, the nearest corresponding figure under "Glass" is 30.7, or 9 sq. ft. This figure, multiplied by exposure factor 1.45, equals 13.05 sq. ft. If window has 39 lin. ft. and is double-hung wood sash, without weather strips, the nearest corresponding figure in the table (using the column headed "50" under "Infiltration") falls between 37.6 and 41.7, or the equivalent of about 9.5 sq. ft. of radiation. Multiplying by 1.45 for exposure, equals 13.77 sq. ft. of radiation.

The three quantities—8.7, 13.05 and 13.77—equal 35.52 or, for simplicity, 36 sq. ft. as the total radiation required for this exposure. The three quantities for any one exposure can be added together and then multiplied by the exposure factor to obtain the same result. No exposure factor is to be used for roofs, floors, ceilings, or partitions or skylights, unless skylights are vertical or practically vertical.

The factor in the last column is the number of B.T.U. per lineal foot of crack per hour per degree difference in temperature.

How to Use the Madison, Wis., Table

Figure from the plans the number of square feet of wall, glass and lineal feet of crack for each exposure. Find the nearest corresponding quantity in appropriate column. Then read horizontally to extreme right or left-hand column for square feet of radiation required. Add additional amount for exposure, as shown in upper right-hand square of data sheet.

For example, for Madison, Wis.: 70 sq. ft. of 12-in. brick wall. Read down the column headed "Plain brick, 12-in."; the nearest corresponding figure in the table falls between 64.8 and 75.6. Following horizontally to extreme left or right shows 6.5 sq. ft. of 38-in. 3-col. radiation. If wall faces north, multiply by 1.25, making 7.9 sq. ft. actually required.

If the same wall has 30 sq. ft. of glass or door, the figure in the table under "Glass" falls between 28.0 and 31.2, or say, 9.5 sq. ft. This figure, multiplied by exposure factor 1.25, equals 11.9 sq. ft. If window has 39 lin. ft. of crack and is double-hung wood sash, without weather strips, the corresponding figure in the table (using the column headed "50" under "Infiltration") is 38.4, or 10 sq. ft. of radiation. Multiplying by 1.25 for exposure, equals 12.5 sq. ft. of radiation.

The three quantities—7.9, 11.9 and 12.5—equal 32.3, or, for simplicity, 32 sq. ft., as the total radiation required for this exposure. The three quantities for any one exposure can be added together and then multiplied by the exposure factor to obtain the same result. No exposure factor is to be used for roofs, floors, ceilings, or partitions or skylights, unless skylights are vertical or practically vertical.

The factor in the last column is the number of B.T.U. per lineal foot of crack per hour per degree difference in temperature.

How "Certified Heating" Operates in Boston

HOW the Boston heating contractors got together on a "certified heating" program for that city, together with details of the plan as worked out, is told in an impressive way by Daniel W. Boynton, secretary of the Heating and Piping Contractors Boston Association, in the *Official Bulletin* for December.

Mr. Boynton emphasizes the fact that much preliminary work had to be done before any public announcement could be made. The problem of boiler classification, for instance, he states, proved perplexing and intricate. Three of the association's best qualified men spent nine months on this one item alone.

TABLE OF FACTORS PREPARED APPLICABLE TO DIFFERENT BOILERS

"To the extent," states Mr. Boynton, "that our resulting Boiler Selection Standards furnish a table of factors applicable to various makes and types of boilers, by which net loads are to be multiplied before comparison with catalogue ratings, the same general idea has been followed out as that of other associations, but these Standards vary in one important respect, in that recognition is given to the fact that draft conditions, as well as boiler size, have much to do with boiler output.

"Accordingly, a few simple stipulations are made as to flue areas and in place of a single set of factors, a number of such sets are supplied, each one for use with a chimney of a stated height. The general effect of this is to permit the use of a constantly smaller boiler in carrying a given load as the chimney height increases; but, to prevent the principle from arriving at ridiculous extremes, certain stop limits are set as applying to boilers of smaller capacities. These Engineering Standards, plus our own Boiler Tables, constitute the 'law and the gospel' of our procedure. They have been gotten together in folder form, together with explanations and worked-out examples as to their proper use, and have been put in the hands of all association members and boiler manufacturers involved, and other interested parties."

FORM AND WORDING OF CERTIFICATE

Another matter that required considerable study was the form and wording of the certificate to be issued. As the value of certified heating to the building owner must depend very largely upon his idea of the sincerity and responsibility of the association, it was decided that the certificate should be in the form of a legally binding guarantee of the association, which should not only state the fact of the job being in accordance with the association's Standards, but should also definitely state what the association would do about it, if it should develop that the installation was not in fact as represented.

The document was made up in as impressive and legal form as might be for the sake of its additional popular appeal and it was made of a fairly large size (11 in. x 8½ in.), suitable for framing and display in conspicuous places. In some cases, the certificate so displayed has served as an effective sales argument in securing tenants for the building.

"It is only natural and right," continues Mr. Boynton, "that an association planning in the last analysis to make itself both morally and legally responsible for work done by others should safeguard itself against losses so far as possible and with this in mind three simple stipulations have been laid down.

"First—No installation shall be certified that has not been actually checked

Certified Heating
Recorded
No.....
Certified Heating Guarantee
Made to .....
For the HEATING APPARATUS installed by.....
In the.....story building at.....
The Heating and Piping Contractors Boston Association, Inc., a corporation organized under the laws of the Commonwealth of Massachusetts, having inspected, upon request of the contractor, the heating apparatus in the building above described, DOES HEREBY CERTIFY that the installation and the work thereon is in accordance with the Approved Standards of this Association.
This Association DOES HEREBY GUARANTEE its Inspection Service to the above named owner and if at any time within twelve (12) months from date it shall appear that this certification is in any way in error, then this Association—the contractor failing to do so—will, without expense to the owner, put the installation into such condition as it represents it now to be.
IN WITNESS WHEREOF the said HEATING and PIPING CONTRACTORS BOSTON ASSOCIATION, Inc., has caused its seal to be attached hereto, and this instrument to be executed by its President and attested to by its Manager, at the City of Boston, Commonwealth of Massachusetts, on the.....day of.....192.....
HEATING and PIPING CONTRACTORS BOSTON ASSOCIATION, INC.
.....Manager
.....President
©GOES 355

Guarantee Certificate Used by Boston Heating Contractors

Application for Certification

To HEATING and PIPING CONTRACTORS
BOSTON ASSOCIATION, Inc.

Gentlemen:—

.....hereby submit plans, specifications and data for checking with the Certified Heating Standards of the said Association, for the

.....located at.....
Description of Building

Owner's name.....

Owner's address.....

Architect's Name.....

Architect's address.....

As partial consideration for the checking of these plans and the ultimate issuance of your certificate to the owner under the CERTIFIED HEATING system, so called, the undersigned does now guarantee to you that.....will have this work performed in a proper manner and in accordance with the plans as approved.

It is further agreed that your duly accredited representative may at all times have access to the work for the purpose of inspection, and that any dispute between said Association and.....shall be referred to a duly appointed committee of said Association whose decision shall be binding and final.

Signed.....

by.....

.....192.....

Application for Certification Blank

by the association and found to be in accordance with its Standards.

"Second—No installation shall be certified that after its completion has not been inspected by the association and found in fact to be in accordance with its Standards.

"Third—No Guarantee Certificate shall be issued by the association until after the contractor involved shall have in his turn first guaranteed to the association that he will put in an outfit that will be in accordance with the terms of the document that he expects the association to issue to his client."

In checking proposed work, blank forms known as "Radiator Schedules" were compiled with the Engineering Standards of the association. These forms help to simplify the work of measuring up a building and figuring the radiation. They are also found to be a great help to the association in its checking because of the uniform method of procedure.

FORM OF GUARANTEE OF THE JOB

In connection with the guarantee, Mr. Boynton states, "The association considers itself as in the business of inspecting heating installations and in so doing it comes into touch with the building owner as a principal to, and not merely an endorser of, the transaction. The effect of this will be seen in the wording of our Guarantee Certificate."

Another form, known as "Application for Certification" is provided for the contractor's use and is turned into the association at the time of submitting the data for checking. The vote of the association authorizing its officers to sign and issue its "Certified Heating Guarantee" makes the filing of these forms by the contractors involved a prerequisite of their signatures.

Finally, the association provides a form known as the "Supplementary Proposal," which is intended to be attached to the bid when delivered. It may be used or not, as the contractor thinks best.

As Mr. Boynton points out, when submitting bids in competition, anything which one man can do to call special attention to his bid in preference to others is worth while, and if in addition to challenging attention, the thing which does it proves to set forth an appealing reason why the contractor in question should receive the award, then so very much the better.

OPERATION OF THE PLAN

To make the operation of the plan still clearer, Mr. Boynton cites a typical use of certified heating in Boston.

"Naturally," he states, "the contractor before submitting his bid will determine for himself that the proposed work will be up to standard. After the work has been awarded, the contractor sends in to the association the 'Radiator Schedule' form made out in duplicate to cover the job, together with such other data as plans or specifications that may be necessary properly to check the layout.

"With this he includes the 'Application for Certification' blank and unless he pays on a monthly basis, his check to cover the association fee for the project. The association promptly checks these data against its Standards, and if found to be not under its requirements, one set of the data is stamped as approved and is returned to the contractor, who is then at liberty to proceed with the work.

"The second set of papers is kept for the permanent records of the association. If discrepancies are found in the contractor's figuring, so that his project will not be up to standard, these of course are called to his attention.

"As soon as the installation is finished, the contractor notifies the association and its representative, taking from the files the checking data of the work, goes to the job and checks it up against the records. On finding them to agree, the 'Certified Heating Guarantee' is made out and sent to the owner. With it goes a letter expressing the interest of the association in the work and asking the help of the owner in recommending the system to others.

"The association charges a nominal fee for each contract its members secure. This is paid by the contractor, but he, in turn, is urged to include it as an item of cost when fixing the job, so that it is the owner who really does—and should—pay the bill.

"The promotion program in Boston," adds Mr. Boynton, "has been a straight

Supplementary Proposal

Certified Heating

As partial consideration for, and conditional upon, the awarding to the undersigned of the contract for the installation of a heating system in the.....building located at .....as covered by the bid of the undersigned dated ..... 192....., the undersigned hereby agrees that.....will have the work performed in a proper manner, and in accordance with the Approved Standards of the Heating and Piping Contractors Boston Association, Inc., of which we are members, and that at the completion of the work .....will employ the Inspection Service of that Association to pass upon the installation and to issue to you its Guarantee of Inspection Service Certificate.

Signed.....

.....*Mass.* *by*.....

.....*192*.....

Supplementary Proposal Blank for Optional Use with Proposal of Certified Heating

selling proposition. Desirable contractors have been personally solicited and architects have been visited. The direct mail method has been considered as the best single advertising medium, and the campaign outlined has consisted of two divisions: First, a general educational program directed, not to architects alone, but also to the officers of savings banks, building loan associations and others financing buildings, and, second, a direct solicitation sent out to architects and prospective builders, known to be live prospects, as shown by such mediums as Dodge reports, building permits issued, etc."

Mr. Boynton quotes instances in Boston where work has been secured at as high as a 10% premium because the owner believed the certification was worth the difference. He also cites cases where one certified heating job has led the contractor to another profitable job.

T. E. B.'s Slogan of "Balanced Management for 1927"

"BALANCED Management for 1927" is the keynote offered by T.E.B. to contractors throughout the country for improving business conditions. The aid and co-operation of the trade press are suggested as a help to bring this idea emphatically before the industry.

In the past a great deal has been said and written on various phases of business management as applied to our industries. The contractor has been told to "sell more", "keep accurate records", "pay attention to estimating", "train apprentices" and many other things. It may be possible that lack of co-ordinating the emphasis on these points has diminished the effect of the pressure applied.

For instance, the manufacturer would say "sell more", and just about the time the contractor would get that message someone else would say "keep better records" and a third person would emphasize the point "give more thought to estimating." The contractor, trying to respond to all these various requests, would hop from one thing to the other with the result that little was accomplished. More concentration on one thing at a time seems necessary.

The T.E.B. thought is to sell the contractor on what may be termed "balanced management"; in other words on a definite program which will enable him to give proportionate time to each of the phases of his business with added emphasis on those points which need extra attention. To do this it is believed necessary to have a definite understanding with all the sources of contractor information and reading so that a co-ordinated campaign may be undertaken with "balanced management for 1927" as its main theme. It is worth while to give such a plan a year's tryout.

Before much effective work can be accomplished it will be necessary for the contractor to get a definite idea of the various phases of his business, their relationship to one another, their relative importance, and the state of their individual efficiency in his own business.

This may be brought about by:

1. Taking a representative contracting business and dividing it into its component parts, namely:
   (a) The business plant which presents a decent appearance and arrangement and makes selling easier.
   (b) Employee relations and training tending to build up a better serving and sales organization.
   (c) Right record keeping, which builds customer confidence.
   (d) Adequate financing so that the business will grow.
   (e) Estimating and the opportunity it offers for sales.
   (f) Purchasing and its relation to customer satisfaction.
   (g) Installation and its importance as a contributory function to satisfaction and repeat business.
   (h) Selling and advertising.
2. Inducing the contractor to give real studied attention to each one of these phases to determine individual efficiency by means of:
   (a) General method of analysis.
   (b) Check-up forms to be furnished or outlined.
   (c) Comparisons by means of standards to be furnished.
3. Inducing the contractor to improve the efficiency of each of the component parts by:
   (a) Adopting standard operating practice.
   (b) Taking advantage of the experience of others.
4. Maintaining effective operation by:
   (a) Periodical check-up of efficiency similar to (2).
   (b) Studying new methods that may be developed.

The ideal way to effect these improvements would, of course, be by personal contact with each contractor and study of his problems on the ground. But expense and other considerations prevent this method being adopted. It is suggested, therefore, that the T.E.B. and the trade press co-operate in putting this program across, as follows:

1. T.E.B. through the Monthly Service Bulletin to present articles each month on 1-2 and 3, timed so as to give a logical sequence to the presentation of each step.
2. T.E.B. to offer individual assistance on each step to the master plumbing or heating contractor through:
   (a) Personally dictated letters of advice.
   (b) Fieldmen's co-operation.
   (c) Printed or multigraphed bulletins.
   (d) Furnish the necessary forms to be used.
1. The trade press to reprint or to support with editorial comment the articles under (1) above.
2. The trade press, individually, but in line with the following program, to promote through its respective media the general theme of the month.

The following monthly program is suggested:

Jan.	"The imperative necessity of balanced management and what the term, balanced management, means."
Feb.	"Consideration of the contractor's business as a unit and in its component parts."
Mch.	"The business plant."
Apr.	"Employee relations and training."
May	"Correct record keeping."
June	"Adequate financing."
July	"Estimating."
Aug.	"Purchasing."
Sept.	"Installation."
Oct.	"Selling and advertising."
Nov.	"Planning holiday sales campaigns."
Dec.	"Analyzing the year's business."

This outline will not interfere with T.E.B.'s regular monthly emphasis on its various services but would be adding to them, with special emphasis on one subject a month.

T.E.B. also believes that one day a month, preferably some day at which all the trade publications and the Bulletin will have reached him and been digested, should be designated and emphasized as the time at which the contractor should give realistic consideration to his business as a whole and detailed study of the particular phase featured in our co-ordinated campaign. The particular day could be decided on in the light of publication dates of the press and with reference to current practice with the contractor.

T. E. B. Publishes Text Book

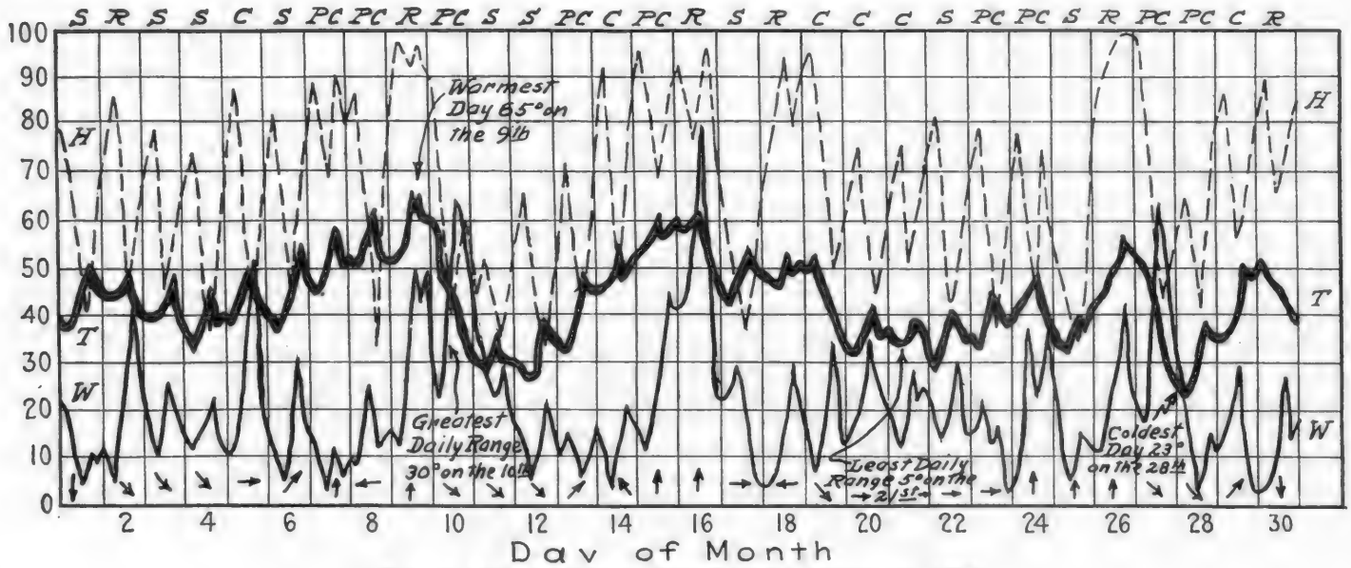
The T.E.B. now has ready for distribution the first copies of its new text book, which has been gotten up by the Apprenticeship Service Department and represents the first step in supplying a dependable book for apprentice use.

A total of 905 pages is included in this book with 573 illustrations; the text is very complete, covering in detail every aspect of the plumbing trade.

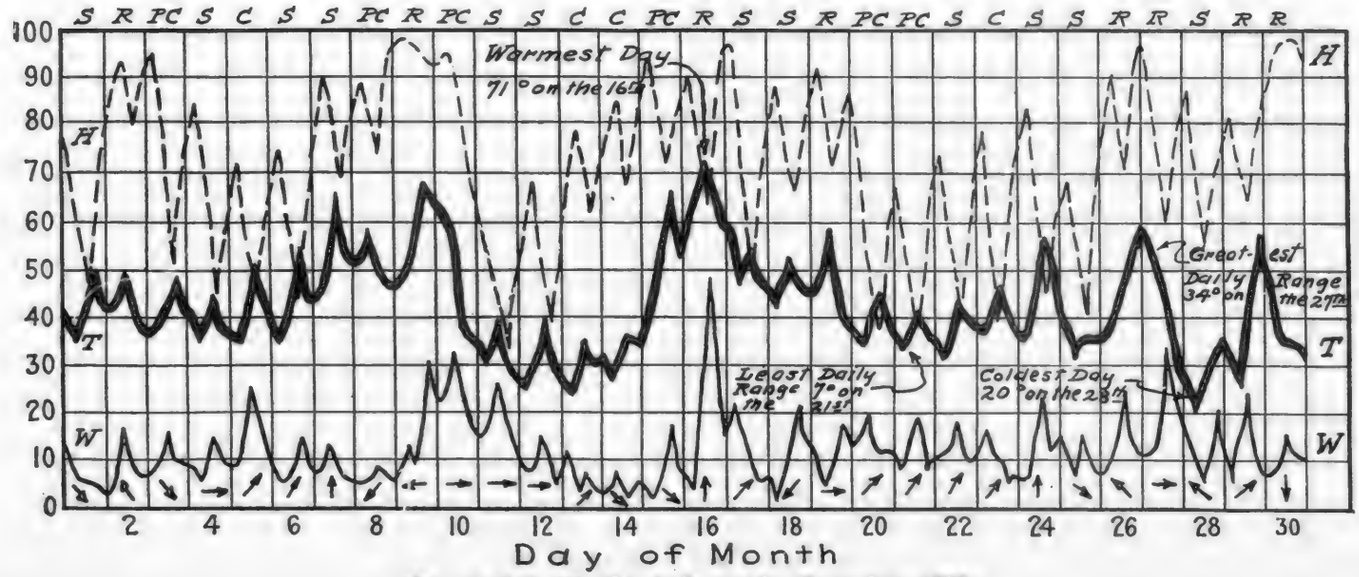
The material is divided into 10 major groups and each group is subdivided into units or sections. The book is purchasable as a whole, with a three-ring leather binder, for $7.50, or $6.00 without the binder. Those not desiring to purchase the whole book at one time can order such groups as they may desire.

The Weather for November, 1926

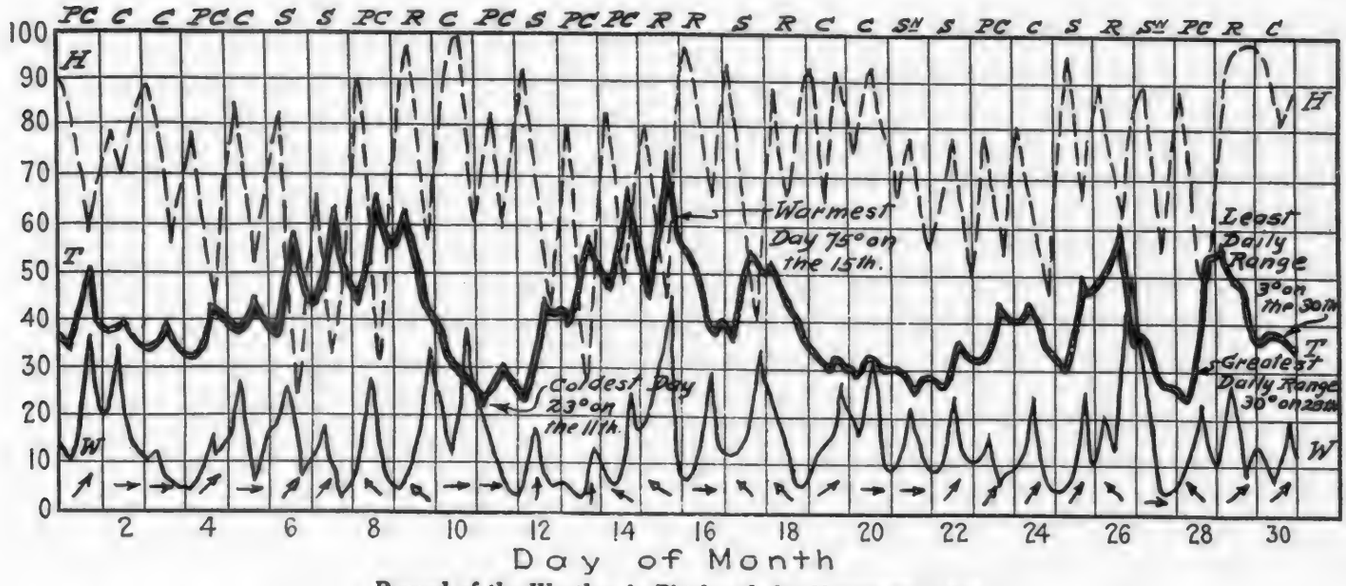
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, deg. F.	65	71	75	63	67
Date of highest temperature	9	16	15	6	6
Lowest temperature, deg. F.	23	20	23	12	17
Date of lowest temperature	28	28	11	21	22
Greatest daily range, deg. F.	30	34	30	36	33
Date of greatest daily range	10	27	28	26	25
Least daily range, deg. F.	5	7	3	4	5
Date of least daily range	21	21	30	18	18
Mean temperature for month, deg. F.	44.0	44.2	41.4	37.0	40.4
Normal mean temp. for month, deg. F.	44.2	42.0	43.2	40.1	45.4
Total precipitation, in.	3.12	4.07	3.27	3.97	2.71
Normal precipitation, this month, in.	3.44	4.10	2.55	2.50	2.88
Total snowfall, in.	Trace	Trace	0.4	3.9	10.4
Total wind movement for month, miles	13843	7384	9618	9920	11032
Average wind velocity, miles per hour	19.2	10.3	13.4	13.8	15.3
Prevailing direction of wind	N.W.	S.W.	W.	S.	S.W.
Number of clear days	7	10	3	4	10
Number of partly cloudy days	12	10	5	6	6
Number of cloudy days	11	10	22	20	14
Number of days with precipitation	9	9	14	11	11
Number of days with snow	1	4	4	5	3
Snow on ground at end of month, in.	None	None	None	None	None


S R S S C S PC PC R PC S S PC C PC R S R C C C S PC PC S R PC PC C R
Warmest Day 65° on the 9th
Greatest Daily Range 30° on the 10th
Least Daily Range 5° on the 21st
Coldest Day 23° on the 28th
H
T
W
Day of Month

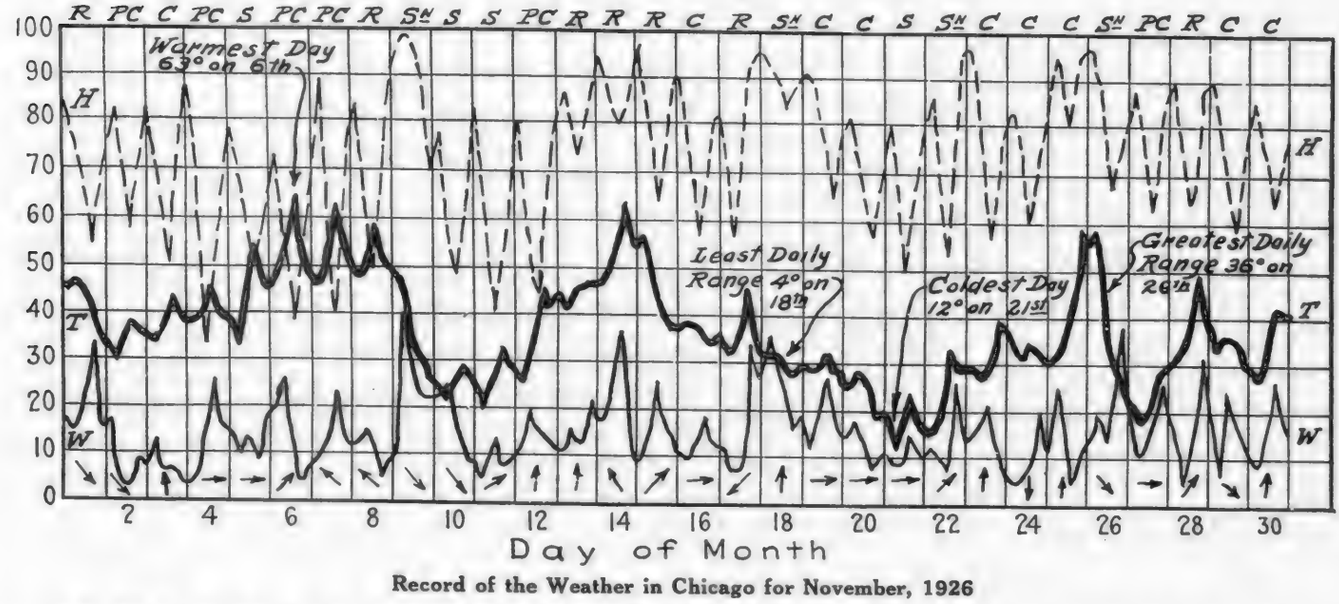
Record of the Weather in New York for November, 1926
(Hourly Observations of the Relative Humidity Plotted on this Chart)


S R PC S C S S PC R PC S S C C PC R S S R PC PC S C S S R R S R R
Warmest Day 71° on the 16th
Least Daily Range 7° on the 21st
Coldest Day 20° on the 28th
Greatest Daily Range 34° on the 27th
H
T
W
Day of Month

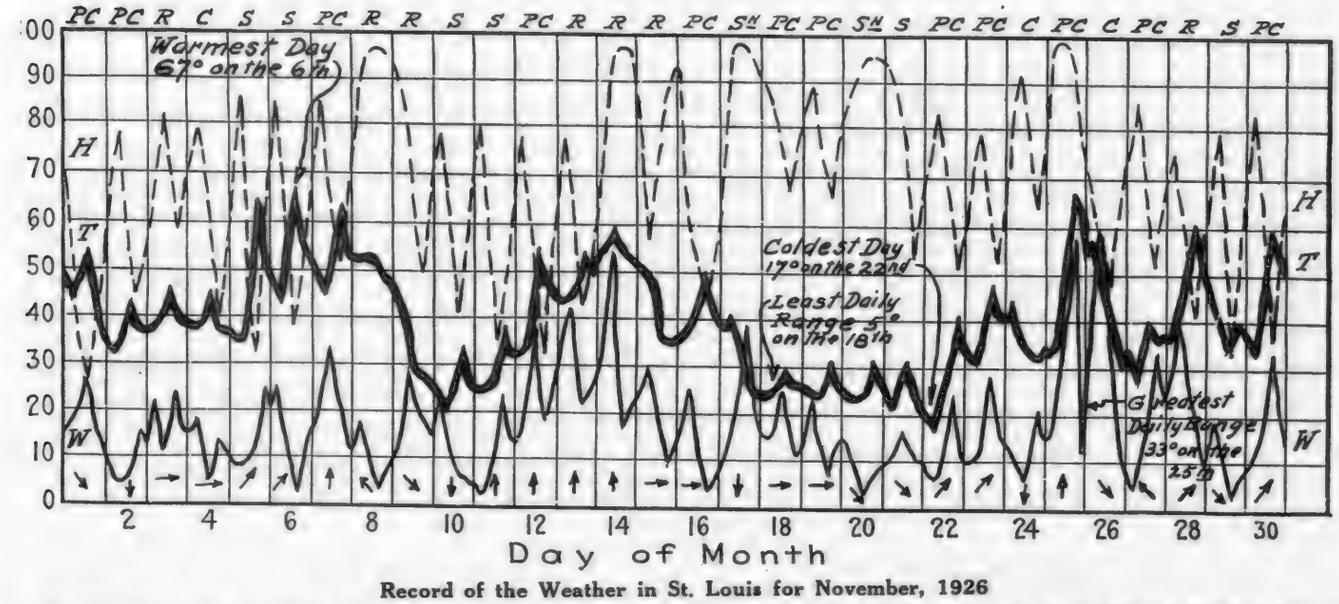
Record of the Weather in Boston for November, 1926


PC C C PC C S S PC R C PC S PC PC R R S R C C Sn S PC C S R Sn PC R C
H
T
W
Warmest Day 75° on the 15th.
Coldest Day 23° on the 11th.
Least Daily Range 3° on the 30th
Greatest Daily Range 30° on 29th
Day of Month

Record of the Weather in Pittsburgh for November, 1926


R PC C PC S PC PC R Sn S S PC R R R C R Sn C C S Sn C C C Sn PC R C C
Warmest Day 63° on 6th
Least Daily Range 4° on 18th
Coldest Day 12° on 21st
Greatest Daily Range 36° on 26th
H
T
W
Day of Month

Record of the Weather in Chicago for November, 1926


PC PC R C S S PC R R S S PC R R R PC Sn PC PC Sn S PC PC C PC C PC R S PC
Warmest Day 67° on the 6th
Coldest Day 17° on the 22nd
Least Daily Range 5° on the 18th
Greatest Daily Range 33° on the 25th
H
T
W
Day of Month

Record of the Weather in St. Louis for November, 1926

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degrees F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M. 12 M., and 8 P.M.
S—clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind, top of page representing north.

Unit Heaters in Plants of General Electric Company

OUR company uses unit heaters extensively in its various works, particularly in its newer plants," states Andrew Vogel, of the Plant Engineering Department of the General Electric Company, writing in *Factory* for December*.

"In some instances it uses them to supplement direct radiation, where it is not possible or desirable to supply sufficient direct radiation—as, for example, at large doorways used for automobile trucks and railroad siding entrances. In other instances unit heaters are used to take care of the temperature difference from the normal mean temperature to the minimum temperatures or extremely low temperatures occasionally occurring in any given locality, as is the situation in some of the newer multi-story buildings.

"In the case of large buildings of the single-story type, unit heaters are frequently used to supply almost the entire heat required, direct radiation being used only where the unit heaters could not be readily installed or under the windows with work-benches adjoining, in order to keep the chilling effect of the glass from being uncomfortable to the workmen. Thermostatic control for operating the fan motors is used as often as is possible."

*Reprinted by special permission from Factory, the magazine of management.

DIFFERENT TREATMENT OF FLOOR AND CEILING-MOUNTED UNITS

As Mr. Vogel points out, "where the opportunity offers to mount the units on the floor, it is possible to use pipe coil or cast-iron radiation for the heating element, since the method of supporting the weight is not an important consideration. When wall-mounted or suspension units are required, it is desirable to use light-weight units, with heating elements made either in a form similar to automobile radiators or of copper tubes with brass helical fins. Deflector vanes are now furnished with many of the unit heaters, and the proper setting of these deflectors controls the air currents to such an extent that the former objection to high-velocity air currents near the heater has been very generally remedied."

MOTOR REQUIREMENTS

"Most of the small-sized unit heaters require motors of less than one horse-power rating, and the motors can be operated directly by thermostats. Motors of one horse-power and larger, thermostatically controlled, require an intermediate magnetic switch for operating the motor circuit. The fractional-horse-power motors, when run on alternating current, should be wound, preferably, for single phase, 110 volts, for operation on the lighting circuit. This automatic operating feature, under the control of the thermostat, is of particular value, since it reduces the amount of heat used to that absolutely necessary to maintain physical comfort, and it prevents overheating the room.

ADVANTAGES OF THERMOSTATIC CONTROL

"Controlling unit heaters by thermostats makes it unnecessary to have anyone in the building to start the heaters when the room temperature falls below that desired, or to stop them when the temperature rises. In most buildings of low-story height, as soon as the machinery is started in the morning, the heat given off by machinery adds to the heat supplied by direct radiation, so that unit heaters should be required only in severe weather during the day.

"The wiring for controlling the motor

Typical Installation of Unit Heaters in a General Electric Plant

by a thermostat should be so arranged that the motor can be operated by a tumbler switch located near and independent of the thermostat. The fan of the heater can then be used for air circulation during the summer montns.

USEFULNESS OF WEATHER DATA

"Plant engineers," states Mr. Vogel, "are now placing reliance for essential heating data upon the reports of the Weather Bureau of the United States Department of Agriculture, usually received in the form of monthly and annual meteorological summaries, and also upon the curves published monthly by THE HEATING AND VENTILATING MAGAZINE, New York." . . . . "Possibly the temperature fluctuations are best illustrated by reference to curves plotted from temperature reports. These curves will indicate at a glance that the normal cold months require only about one-half to two-thirds of the maximum heat which is required a few days during the winter. Such being the case, it becomes apparent that the heating system should be flexible, so that it can adjust itself to these fluctuations automatically, if possible, or at least require a minimum amount of manipulation of heating mediums.

HOW UNIT HEATERS MEET THE PEAK HEATING LOADS

"Some buildings are of such large cubical dimensions, and the nature of the work within them is such, that unit heaters can be so placed as to be utilized for heating the building for the entire range of temperature. Where the unit heaters can be placed to advantage so that no air currents strike the workers, they form possibly the most flexible and economical form of heating in use at the present time. Where the story heights are low and the velocity of air from the heaters is objectionable to the workers, it is possible to arrange radiation under the windows to care for the temperature difference between the normal mean temperature and the room temperature desired, and use unit heaters for severe weather only.

"Thus, in Philadelphia, radiation can be designed for the difference between 25° and 65°, or 40°. On account of the fact that the temperature in Philadelphia may fall as low as zero—on a few days, it has fallen as low as 5° below zero—the additional heat required for a temperature drop from 25° to zero may be supplied by unit heaters. Inasmuch as the extremely low temperatures are most frequently reached during the night, when there are no workmen in the building, there can be no objections whatever to the unit heaters at that time, due to air currents.

"The success of the heater," adds Mr. Vogel, "depends very largely upon the reliability of the motor that runs the fan. Such motors should have ample power to move the air against the resistance of the radiator passages, and should be substantially fool-proof. For some types of heaters, totally enclosed motors are preferred. Both waste-packed bearings and ball bearings have been used to advantage. Both of these types of bearings require lubrication only at infrequent intervals. Where the design of the heater is such that vertical motors are required, ball bearings are to be preferred.

THE FUTURE OF THE UNIT HEATER

"The increasing cost of fuel has already required engineers to give a greater amount of thought to the heating problem as a whole. This involves not only better building construction, including particularly the installation of insulation between radiators and outside walls (not yet practiced, but soon to come), but also the use of more flexible heating systems.

"Radiation will continue to be used under windows and where air circulation is not desirable, but the peak loads of the heating system will be, wherever possible, cared for by automatically-operated heating equipment, of which the unit heater gives the most promise of fulfilling the requirements."

Program of Three-Day Institute at Pittsburgh

The program arranged for the third annual Three-Day Institute, to be held at Pittsburgh, Pa., January 18-20, under the auspices of the Department of Industrial Relations, Carnegie Institute of Technology, is outlined in the following preliminary schedule of the meeting. While a large portion of the subjects relate to plumbing, the matter of heating is also to receive considerable attention, as will be noted by a study of the outline presented.

Tuesday, January 18. Morning—registration, opening addresses. Afternoon—business and salesmanship, welding in the plumbing and heating industry, the welding process.

Wednesday, January 19. Morning—decoration of a bathroom, chemistry of plumbing and heating. Afternoon—building construction, plumbing and heating installation, discussion of subjects vital to plumbing and heating industry.

Thursday, January 20. Morning—water supply and sewage disposal, plumbing and heating as they affect health. Afternoon—the plumbing code.

In connection with the institute, there will be an exhibit of plumbing, heating and ventilating products manufactured in the Pittsburgh district.

Continued Growth of Gas Utilization

A 64% increase in gas sales for industrial heating processes is reported in *Gas Progress* for December. Speedy introduction of gas-operated ice machines to balance up the winter heating load is also predicted and the general awakening of the public to the nuisance and expense which the smoke evil is causing is cited as an encouraging factor to the gas industry.

Death of W. M. Pattison

W. M. Pattison, president of the W. H. Pattison Supply Co., Cleveland, O., died November 16, after an illness lasting nearly two months.

Mr. Pattison organized the W. H. Pattison Supply Company, wholesale dealers in heating and plumbing materials, in 1897, and previous to that date was connected with Worthington Hardware Company. He was most active in both business and civic affairs, having served as president of the National Supply and Machinery Association, chairman of committees of the National Pipe and Supplies Association, president of the City Club, president of the Cleveland Association of Credit Men, director of the Chamber of Commerce and was a member of the Union Club.

He is survived by a widow, one son, one daughter and a brother.

Death of Wallace E. Boardman

The death of Wallace E. Boardman occurred October 25 at Wakefield, Mass. Mr. Boardman, at the time of his death, was responsible for the design of heating, ventilating, plumbing and industrial work and has supervised several government projects. He was a member of the Massachusetts Chapter of the A. S. H. & V. E. and also the American Society of Mechanical Engineers. Between 1911 and 1915, Mr. Boardman was associated with Professor S. Homer Woodbridge and previous to this was connected with Wells Brothers Company, Greenville, Mass.

Mr. Boardman is survived by his wife, sister and brother, all of Wakefield, Mass.

STEPHEN J. BROWN, president of Globe Ventilating Company, died at the Leonard Hospital, Troy, N. Y., October 29. Mr. Brown joined the A.S.H. & V.E. in 1919 and was active in some of the society's committee work, especially during the period following the great war. He had been connected with the Globe Ventilator Company for many years. Mr. Brown was 65 years old.

C. E. GREEN, vice-president and general sales manager of the Midwest Air Filters, Inc., Bradford, Pa., died at his home in Bradford, December 18. Mr. Green had been ill for some time, having never fully recovered from an attack of influenza last Fall. He was a familiar figure at meetings of the American Society of Heating and Ventilating Engineers, although he had been missed at recent gatherings of the society.

Mr. Green was forty years old. He had been actively identified with the development of the dry air filter method in general and of the product of the Midwest air filters in particular from its inception.

Grates for Burning Small-Sized Anthracite

Previous articles in this series are as follows:

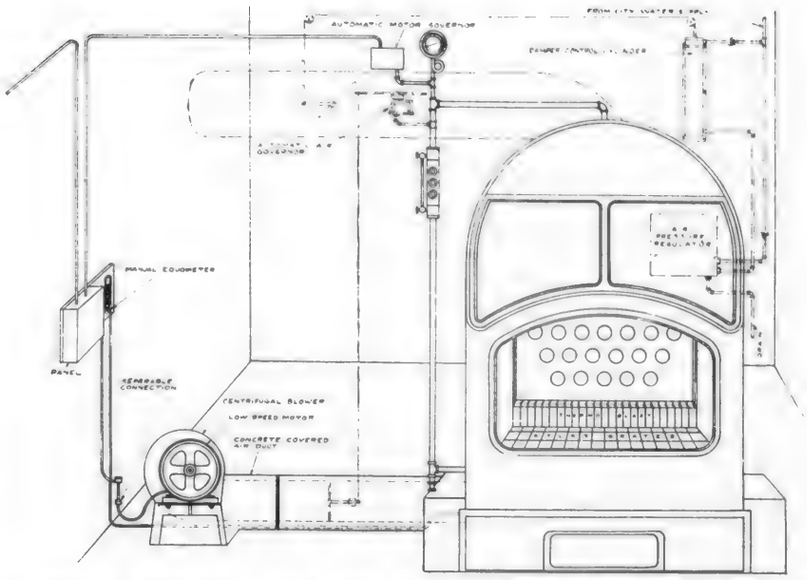
1.—*Neemes, October*, 1926
2.—*Johnson, November*, 1926.
3.—*Rath, November*, 1926.
4.—*Pyramid, December*, 1926
5.—*Culm-Burn, December*, 1926.

6—Atlas

THE grate equipment manufactured by the Atlas Combustion Co., Inc., 110 East 42nd St., New York, consists of three distinct units; first, there are the grates themselves; second, the Thermo-Blast suppling preheated air to the fuel, and third, the Manual or Automatic Equometer, a device for regulating the draft.

In design, the grates are arranged to have a free air space of 19.7%, and care has been taken to bevel all openings to aid in the free passage of air. The design also presents a smooth surface for the unobstructed passageway of the slice bar and to prevent the clinker adhering to the grate. In addition, the grate is reinforced and arranged so as to have no projecting edges or points which in time might warp, crack or burn out.

Preheated air is supplied to the fuel bed by the Thermo Blast, a device installed in the rear of the grates, the idea being to partially prevent the formation of gases and to allow the combustion of such gases as are formed. This device allows the carrying of a thicker fire and prolongs the firing period from two to five hours.



Complete Assembly View of Atlas Thermo-Blast and Control Management

The Equometer regulates the draft in such a manner as to maintain the same amount of draft in the combustion chamber over the fire bed at all times, in spite of the variation of the load and condition of the fire. The Equometer really consists of two distinct pieces of control apparatus, one with the control or air pressure regulator, located where the intensity of draft will govern its action, and the other a standard form of control governed by the steam pressure.

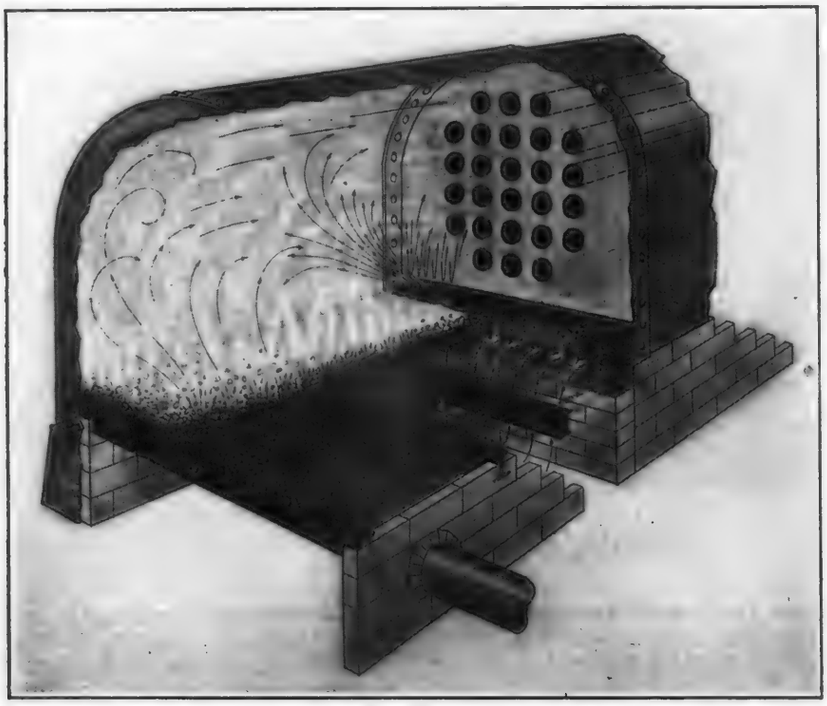
When the thickness of fuel bed changes or fresh coal is put on the fire, so as to reduce the amount of steam generated, the drop in steam pressure immediately opens the blast gate, admitting more air under the grate. This air, forcing its way up through the fire, tends to destroy the negative pressure or draft over the fire.

Here the sensitive air pressure regulator comes into play and acts on the damper in the smoke breeching, opening it so as to allow more gases to flow past the damper into the chimney and bringing back the negative condition, or draft, over the fire to very nearly its former intensity.

These two controllers, acting in conjunction with each other, operate so as constantly to maintain a set steam pressure, a fixed draft intensity, and a forced blast air quantity as required.

The forced blast equipment consists of a low-speed, centrifugal-type blower and two low-speed, electric motors, each with a separable connection which permits the substitution of either motor without disturbing the wiring. The blast from this blower, as previously noted, is controlled by a damper operated by the automatic regulator on the steam line.

Taken as a whole, the system may be termed a stationary, air-cooled grate arrangement, adapted for burning the smaller sizes of buckwheat and no changes in the chimney or breeching are necessary for its installation.



Atlas Grates Applied to Fire Tube Boiler

Present Practice in Vapor Heating

Previous articles in this series are:

1. *Webster Type R Modulation System, August*, 1926.
2. *Dunham Home Heating System, August*, 1926.
3. *The Illinois System, September*, 1926.
4. *Hoffman Controlled Heat, September*, 1926.
5. *The Mouat System, October*, 1926.
6. *The Tranc System, November*, 1926.
7. *The Sarco System, December*, 1926.

8—O-E Perfect 3-in-1 System

IN the design of the O-E Perfect vapor vacuum-pressure system, every effort has been made to reduce the number of parts to the fewest possible. As will be seen from Fig. 1, the special devices used are limited to packless graduated radiator valves, water-seal ball-check union elbows on the radiator returns and a combined air exhauster and vacuum valve located on the return main near the boiler.

Vapor generated in the boiler passes up through the main supply pipe to the several radiators through small individual supply pipes from the main. The vapor is admitted to each radiator at the top through an O-E packless graduated valve. As the vapor condenses in the radiator, the water of condensation falls to the bottom of same and is returned to the boiler through a ½-in. O-E return fitting, connected into a ½-in. pipe, thence into the main return pipe in the basement.

In passing through the return fitting, the water is first trapped by a wall or diaphragm, cast in the elbow outside of the radiator (Fig. 3) making a water seal which is designed to hold

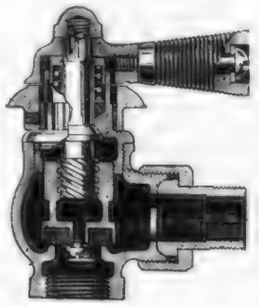


Fig. 2. O-E Packless Valve

the vapor in the radiator and to prevent it from short-circuiting into the return main.

To avoid water being drawn back into the radiators when the supply valve at the top of the radiators is closed, provision is made in the O-E return fitting to avoid this trouble by equipping it with a small non-corrosive ball operating on a smooth guide or track and arranged so that when a vacuum is formed in the radiator the ball will immediately roll against the port and prevent water from being drawn into the radiator from the return pipe. Noiseless operation is secured by having the water seal below the ball. The opening of the supply valve at the top of the radiator causes the ball in

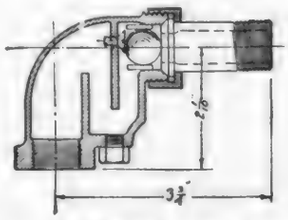


Fig. 3. O-E Ball-Check Water-Seal Return Fitting

the return fitting to roll off its seat, permitting condensation and air to pass into the return main. An air vent is tapped in the adjustable screw top of the return fitting to allow the air to escape freely into the return system when the supply valve is open and also to equalize the pressure on both sides of the water seal, thus preventing it from siphoning out.

All air and condensation pass through the main return pipe in the basement to a point above the boiler where the air is separated from the water. Air passes up and through the O-E exhauster (Fig. 4) out into the atmosphere, while the water returns to the boiler.

The O-E exhauster and vacuum valve is connected to a high point above

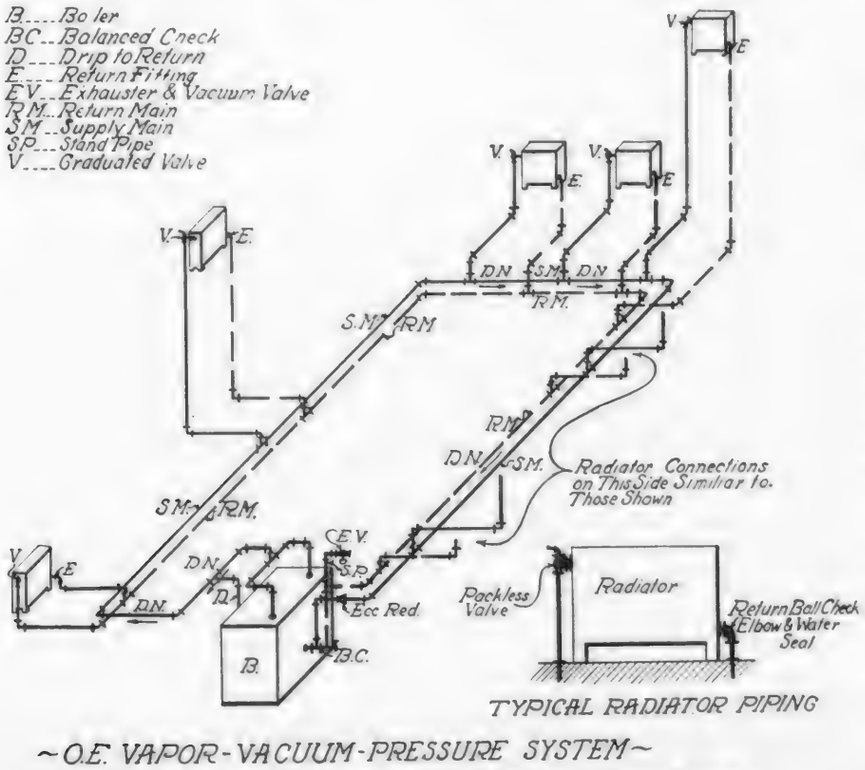


Fig. 1. Typical Arrangement of O-E 3-in-1 Vapor System

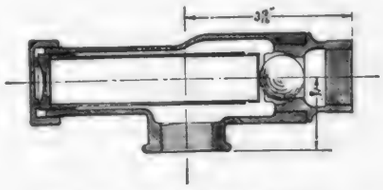


Fig. 4. O-E Air Exhauster

where the return main drops down to the return opening in the boiler. The exhauster remains open while there is any air in the system. As soon as vapor comes into contact with the carbon post in the exhauster, the post expands and forces a hollow bronze ball against the seat, closing the port. When closed, the system will cool slightly, causing a vacuum to form and this will hold the ball on the seat of the exhauster as long as there is a vacuum in the system. As soon as the vacuum is broken, on account of air getting into the system, the ball will roll away from the seat in the exhauster, again permitting the air to escape.

Means to make the exhauster foolproof are taken by having a brass shell or reinforcement around the expansion member to prevent the post from get-

ting out of shape, if, for instance, it should be screwed down against the seat when cool. The cap locks the expansion post after it is properly adjusted. All exhausters are set for ordinary use, but can be adjusted to suit any particular system to which they are attached. They are threaded 1 in. both inlet and outlet.

The O-E packless valve (Fig. 2) used with this system is of the quick-opening type, requiring one-half turn to completely open it. Its handle is made of hard rubber and has a graduated dial and pointer. The dial is cast on an angle so as to be easily read from some distance.

The ball-check water-seat union elbow is made in two sizes, ½-in. and ¾-in., and the air exhauster and vacuum valve is made in but one size, 1-in. The O-E packless gradulated valve comes in seven sizes, ¼ to 2½ inclusive. The system is manufactured by the O-E Specialty Mfg. Co., Milwaukee, Wis.

Building Managers and Owners Association Hears Talk on Cast Iron Boilers

The use of the cast-iron sectional boiler for low-pressure heating work was the theme of an address by H. W. Fiedler, chief engineer of the Burnham Boiler Corp., Tarrytown, N. Y., made to the Building Managers and Owners Association at its regular monthly meeting in New York, December 9.

Mr. Fiedler first spoke of the history of the Lord & Burnham Company, from the time of its organization by Messrs. Lord and Burnham, in 1873, down to 1901, and of the Burnham Boiler Corporation, which was organized in 1901 to manufacture heating boilers exclusively.

After comparing the basic differences in the designs used in the construction of cast-iron and steel boilers, Mr. Fiedler stated that a favorite argument against cast-iron boilers is the danger from cracked sections. "This could be overcome," he said, "by the use of an automatic water feeder which, without attention, will fill up the boiler to the proper level in cases of low water, and will spill any excess of water to the sewer, if, at any time, a surge of water comes back from the returns sufficient to flood the boiler or raise the proper water line."

Mr. Fiedler devoted the major portion of his talk to the characteristic features of the Burnham boiler and the suitability for large low-pressure installations. He also pointed out their adaptability for burning oil, gas, and buckwheat coal, through the installation of suitable equipment.

After the completion of the address, informal discussion of the subject was entered into, and some of the members were of the opinion that cast-iron sectional boilers would be more practicable if the bottom of the firing door was lowered to come even with the top of the grate. This suggestion was brought about by the fact that the highest type of engineers and firemen are not usually employed in low-pressure heating plants which run during the winter only, and that such men as were commonly employed, seemed to prefer cleaning their fires on a plate and from the top, rather than from the bottom by means of shaking or rocking grates.

Larger Quarters for Heating and Piping Contractors National Association

Growing activities at the headquarters of the Heating and Piping Contractors National Association have made more space necessary and at the meeting of the Board of Directors in New York, December 6-7, authorization was given to procure larger quarters. At the same meeting, the directors voted to renew its contributions to the National Trade Extension Bureau and to the Research Laboratory of the American Society of Heating and Ventilating Engineers.

In reporting for the Committee on Standardization, Chairman W. L. Fleisher emphasized the fact that, because of the growth of standardization work, his committee is becoming more and more a co-ordinating committee, with special committees making investigations and reports on work started by the central committee.

Mr. Fleisher spoke of the work done on flanges and flanged fittings and screwed fittings in co-operation with the American Engineering Standards Committee. He predicted that the first of these standards would be ready for publication soon after the first of the year.

Other actions taken at this meeting were the appointment of E. W. Verity, Jr., New York, as chairman of the Membership Committee, and of Secretary Henry B. Gombers, as a member of the Committee on Wrought-Iron and Wrought-Steel Pipes, Valves and Fittings of the Department of Commerce of the United States.

Committee on Certified Heating to Conduct a National Survey

An exhaustive study of certified heating, the formulation of the fundamental principles upon which certified heating should be operated, and the standardizing of the procedures under such a program, so as to eliminate the differences in methods which now exist, will be undertaken by a special committee, which has just been appointed by the Heating and Piping Contractors National Association. The committee, which consists of three contractor members and three secretaries now operating certified heating programs, is made up of the following:

Herbert A. Snow, Boston, chairman; W. D. Emery, New York; E. M. Harrigan, Detroit—all contractors; and L. T. Braun, Chicago; Thomas Gale, St. Louis; and A. R. Herske, Cleveland—all secretaries. Joseph C. Fitts, New York, a member of the staff at National Headquarters, is secretary of the committee.

The committee realized that, during the experimental stages of Certified Heating, when it was being tried in only a few cities and was being built up by the associations in those cities, differences in method would arise. Now that the movement is becoming more national in scope it is necessary to eliminate such differences and the confusion which would accompany them.

The first step in the work was a survey of existing conditions, by means of a questionnaire to those cities now operating Certified Heating. This has been completed. After considering existing conditions, the committee went to work on the fundamental principles underlying the Certified Heating movement. Considerable progress was made and will be told in a report to be presented to the next annual convention of the National Association in the spring.

Program of T. E. B. Conference for Presidents and Secretaries

The Presidents and Secretaries Conference, to be held under the auspices of the T. E. B. January 11-13, at Evansville, Ind., has a program containing many subjects of interest to the industry. A detailed report of this conference will appear in THE HEATING AND VENTILATING MAGAZINE for February.

PROCEEDINGS OF THE SEVENTH ANNUAL CONVENTION OF THE NATIONAL DISTRICT HEATING ASSOCIATION, held at Niagara Falls, N. Y., June 1-4, 1926, have been published and constitute a volume of 412 pages. In addition to the proceedings themselves, the text includes a revised list of members. Some 32 pages are devoted to a stenographic report of the session, scheduled on the program as "A Symposium of Recent Developments in and Future Trend of Central Station Heating." The section includes L. B. Young's paper on "Expansion of Steam Heating Utility in St. Louis"; William J. Baldwin's paper on "Central Station Steam Plants in New York City"; J. H. Walker's paper on "Recent Developments in District Heating in Detroit"; C. H. Day's account of the situation in Cleveland, and R. D. DeWolf's story of the development in Rochester.

New Apparatus and Appliances

Petro Vacuum-Retarding Valve

While it is undoubtedly better practice to install fuel-storage tanks for oil-burning installations below the level of the pumps supplying oil to the burners, it is frequently impossible or undesirable so to place them. The requirements of the Underwriters for the introduction of a vacuum-breaking device to prevent the siphoning of oil from the tanks to the boiler-room, in case of a break in the piping, have been met by the vacuum-retarding system of the Petroleum Heat & Power Co., New York.

The system consists of two elements —a special retarding valve and a small vacuum tank mounted on top of the fuel-storage tank. The suction line from the pump is attached to the retarding valve, which has three connections on it. The second connection on the retarding valve is directly to the suction pipe within the storage tank. The third connection is to the vacuum tank, which is closed and has no other opening of any kind.

If the fuel tank is full of oil and the piping system connected to the burner, the pump, when started, will draw upon the suction line and will gradually exhaust the air from it. As soon as enough of a partial vacuum has been created in the suction line, the oil will be drawn into it and thence to the pump, which will pick it up and force it to the burner under pressure.

The object of the retarding valve is to put an additional resistance in the suction line, so that the pump will have to pull somewhat harder with the retarding valve in place, in order to lift the fuel out of the tank and draw it to the pump. The vacuum tank, however, is so connected that all of the suction of the pump is exerted upon its interior, independent of the retarding valve.

As a result, when the pump is started, it exhausts air from the suction line between itself and the retarding valve. As the vacuum tank is directly connected to the pump, air is exhausted from the vacuum tank at the same time, and a partial vacuum created in it. After this vacuum has reached a certain point, the retarding valve opens and oil immediately is drawn from the tank.

Now, if for any reason there should be a leak in the suction pipe, the partial vacuum, which has been formed in the vacuum tank, will draw all the oil in the suction line on the pump side of the retarding valve into the vacuum tank, where it will remain until the break has been repaired and the pump is again started. In this way, there is no possibility of oil being spilled on the floor.

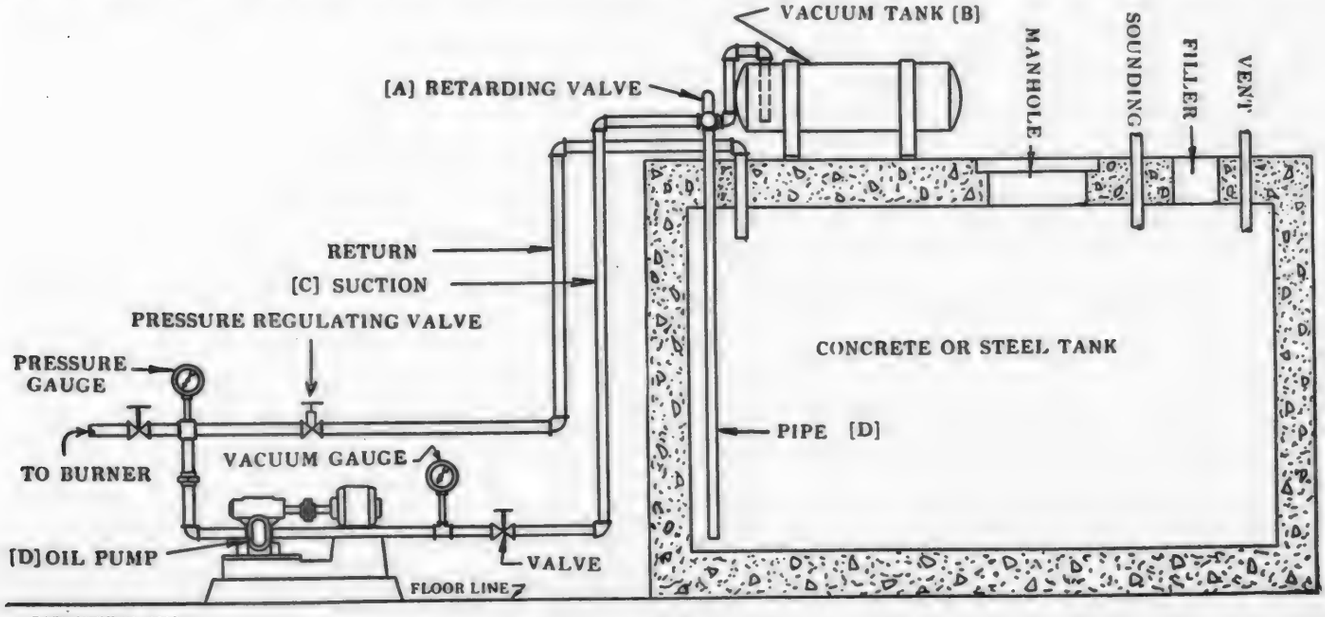
At the same time the break occurs the retarding valve will close, thus preventing the drawing of any oil out of the storage tank itself through siphoning. The only requisite for the satisfactory operation of this system is that the vacuum tank shall have a volume sufficiently greater than the volume of the suction piping, so that it can contain all of the oil in it and still leave room for the small air content remaining.

The company has devised a chart by which the proper size of vacuum tank can be determined for any installation. The retarding valve is used as part of the vacuum-retarding system, as described. It is made in six sizes, from 3/8-in. to 2-in. pipe size. This retarding valve is accepted by the Underwriters' Laboratories and the National Board of Fire Underwriters.

Petro Vacuum Retarding Valve

Buckeye Copper-Tube Radiator

In announcing a new copper-tube radiator, designed to be specifically used in Heatovent and Thermovent units, the Buckeye Blower Co., Columbus, O., presents a heat-transfer device of high efficiency and apparently of extreme ruggedness. The radiator tubes

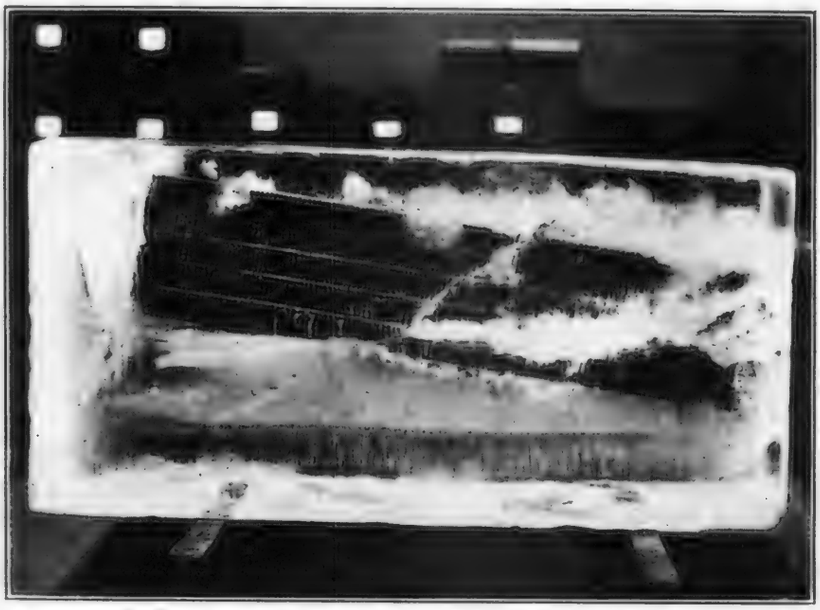


Vacuum Retarding System of Petroleum Heat & Power Company

are rectangular in section with rounded corners. These are electrically-welded to brass headers and the fins, rectangular sheets of copper flanged on the end for spacing, are forced over the copper tubes.

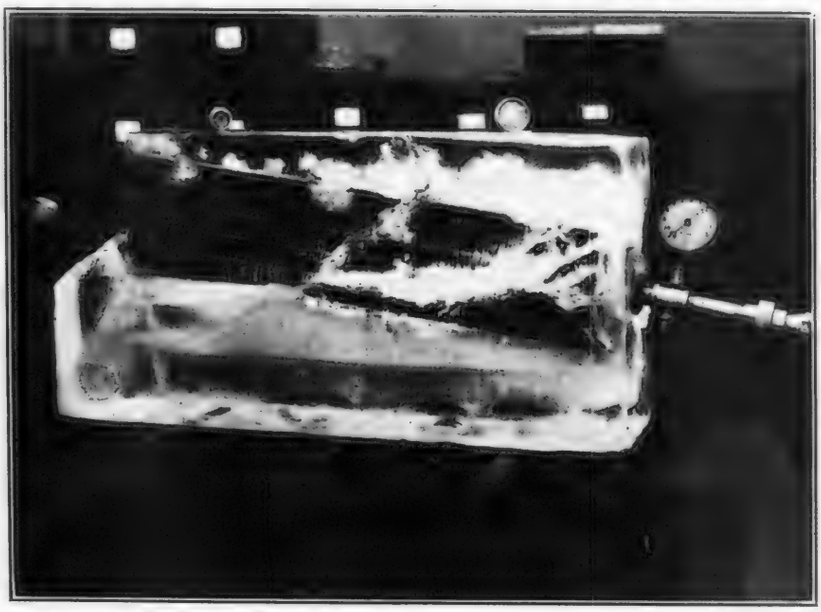
A series of tests on one of these radiators was recently made at the factory to determine the strength and durability of the radiator when subjected to abnormal extremes of heat and cold. The return end of the radiator was closed with a standard 1-in. pipe plug, the radiator was then stood on end and completely filled with water, after which the supply end was closed with a 2-in. standard pipe plug.

The radiator was then delivered to the local ice company, where it was frozen into a 300-lb. block of ice. Reference to a photograph of this block after removal from the can shows that the expansion of the radiator cracked this block of ice in several places. The ice was then chipped away from the ends of the radiator, exposing the plugs which were removed, after which a steam connection was made to a header and steam at 2 lbs. pressure was applied at one end. As soon as the effect of the steam began to be felt and some of the interior ice melted, the pressure was increased to 15 lbs.



Buckeye Copper-Tube Radiator Frozen in Ice Block

In due course of time, the radiator was entirely freed from ice in its interior and the water of condensation ran from the opposite end. After the heat from the radiator had melted the exterior ice to the point where it dropped away, a careful examination showed no breaks, cracks or other damage to the radiator. The ends were then plugged and under an air pressure of 30 lbs., the radiator was immersed in a tank of water, but failed to show leaks of any kind.

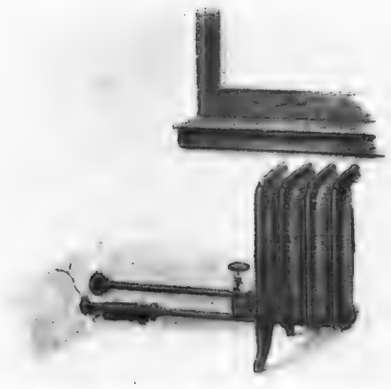


Steam Applied to Radiator, Thawing Ice Within Radiator and Surrounding Ice Block

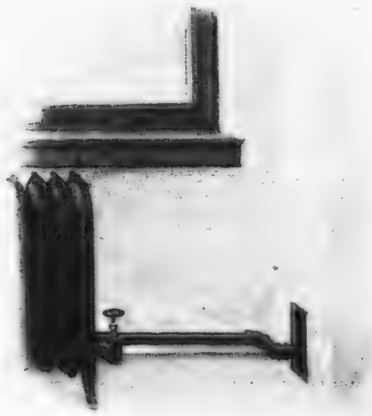
A second test was designed to ascertain whether or not the radiator would be distorted if the ends were first frozen solid before water in the middle part of the radiator was allowed to freeze. In this test, the middle portion of the radiator was wrapped in insulating materials and the two ends frozen, after which the entire radiator was immersed and the water in it frozen solid.

The radiator was then thawed out by process similar to that used in the first test and, when completely free from ice, showed no air leakage. A careful examination of the radiator structure at the end of these two tests, the same radiator being used for both, showed no distortion or mechanical damage, and under an extreme test of 90 lbs. air pressure submerged, showed no signs of leakage at any point. It would seem that these tests amply demonstrate the ruggedness and mechanical strength of the radiator in no uncertain way, as the treatment received in the test was undoubtedly more destructive than a radiator would be called upon to face in a lifetime of service.

Radiator After Test, Showing No Mechanical Defects



Possible Effect of Expansion where Plinth Block is not used



Typical Radiator Runout With Expansion Plinth Block

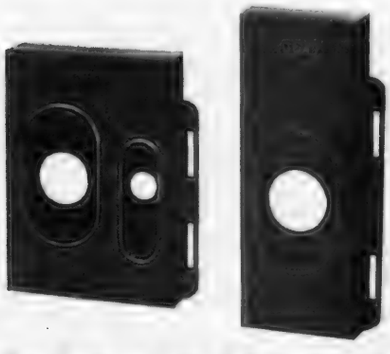
Expansion Plinth Blocks

An adjustable plinth block, for use in buildings to overcome trouble due to expansion and contraction of riser pipes and to supply an adjustable opening in walls to accommodate pipes passing through the base-board and wainscotting, has been placed on the market by H. M. Hart, 104 West Van Buren St., Chicago, Ill. Mr. Hart is president of the L. H. Prentice Company of Chicago, and is also president of the Heating and Piping Contractors National Association.

These blocks are designed to obviate the necessity of having a man constantly on hand to see that a space is left either above or below the pipe, as the case may be, to allow the proper clearance for expansion and contraction.

As is pointed out in the circular, it has been found difficult to make a finish around the pipe which passes through an ornamental base-board or where a narrow cement or marble base-board is used, since part of the pipe may come in the base-board and part above the base-board. In either case where the ordinary thimble and plate are used, only a portion of the hole is covered. In the expansion plinth blocks, the hole for the pipe connection in the riser is completely covered by the removable or sliding plate. The device is 10 in. high and 4 in. wide, made of smooth finished cast-iron and can be decorated to correspond with the adjoining wall. The blocks are made for any size pipe, from ¾-in. to 2 in. where desired. It can be permanently secured in place against woodwork, plaster and tiling, while jobs are being roughed-in. The plinth block, being 1¼-in. deep, the finish is flush, or nearly so, with the base-board. When nailed in place, the base-board covers the projecting flange of the block. The sliding plate always fits tightly.

Architects designing concealed pipe risers, it is pointed out, may avoid the cost of additional cinder and deadening work through the use of this device. It is also featured as overcoming a great trouble in high buildings, namely, the breaking-off of branch connections of the tees in the riser, due to constant strain where insufficient allowance has been made for expansion and contraction. Ideal expansion plinth blocks are supplied in six different styles, those here illustrated being typical one-pipe and two-pipe units.



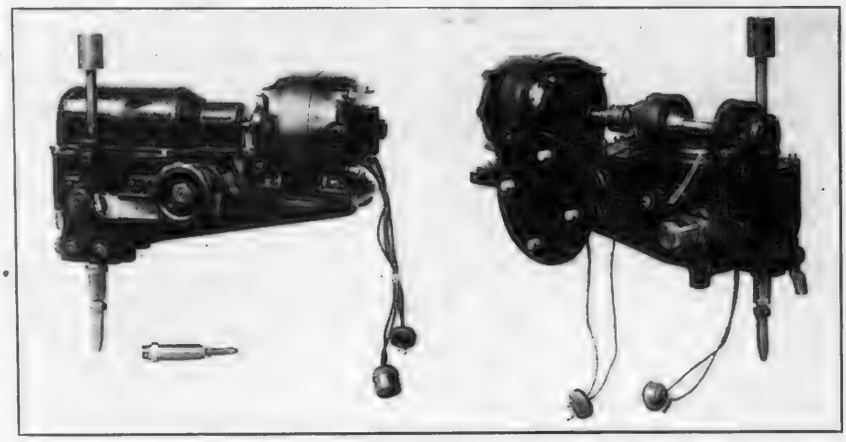
Two Styles of Ideal Expansion Plinth Blocks

started by touching the electrode to the work, then withdrawing it, thereafter maintaining a constant arc length by feeding the electrode wire to the weld at the exact rate of speed necessary to replace the electrode fused into the weld.

It is claimed that the new equipment will perform these operations more rapidly and with a greater degree of accuracy than is possible by the most expert hand operators.

The automatic welding head incorporates the necessary mechanism for feeding the electrode to the arc and consists essentially of a pair of feed rollers geared to a constant speed motor through a magnetic clutch. The gearing and feed mechanism are contained in one housing to which the motor is bolted. Rollers feed the welding wire through the nozzle to the arc, the distance and pressure between these nozzles being readily adjustable. Each welding head is equipped with a set of nozzles for 3/32-in., 1/8-in., 5/32-in., 3/16-in. and 1/4-in. wire.

The speed of the wire feed may be adjusted by a selective gear changer which permits the gear ratio to be altered at will to adapt the speed of the feed rollers to the size of wire and the welding current used. Three gear speed changes can be made by moving the gear shift pin which extends from the rear of the gear housing and an additional finer adjustment can be made by a rheostat in the field of the motor.



G. E. Automatic Welder

Welder with Casing Removed

Provision is made for pointing the electrode backward or forward in the line of weld and also for moving it sideways, the pointing of the electrode being obtained by rotating the head on its horizontal shaft and the lateral movement by means of a handwheel.

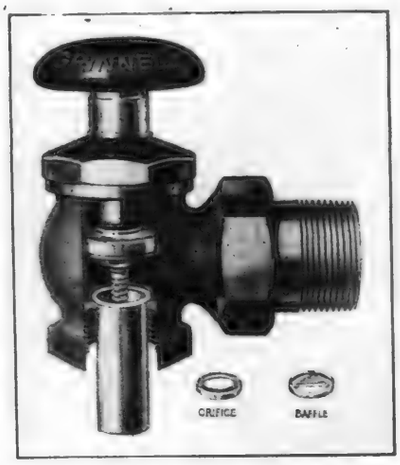
A control panel, a meter panel and a push-button station comprise the control equipment. The control panel mounts the main line contactor for the welding circuit and two smaller contactors for interlocking the travel motor with the arc. The magnetic clutch is operated forward or backward by a voltage relay, and one rheostat controls the speed of the feed motor and the heat, while the other controls the voltage setting of the arc.

General Electric Automatic Welder

A design of automatic arc welder, which welds with great smoothness, speed, and accuracy, has been placed on the market by the General Electric Co., Schenectady, N. Y. With this equipment, the operator needs but to push a button to start the sequence of operations which produces the weld without further effort or skill on his part. The arc is first

Grinnell Equiflo Valve

In an effort to simplify the design and installation of forced hot water systems and to make them as easy to install and operate as steam or vapor systems, The Grinnell Co., Providence, R. I., has brought out a new radiator valve, which is being marketed under the name of Equiflo.



Grinnell Equiflo Valve for Water Heating Systems

The valve may be generally described as of the packless radiator type, combined with a cartridge or tube arranged on the multiple orifice principle. This tube, being made up of a series of numerous orifices and baffles, is capable of setting up any desired frictional resistance at any radiator connection.

Differing from the throttle valve, the Equiflo valve has a resistance which is predetermined and non-adjustable. It is claimed that by this simple method of adjusting resistances it does away almost entirely with the elaborate calculation of pipe sizes formerly considered a necessary requisite of forced hot water design. Besides this, all radiators of the same size can be connected up with the same size runout and valve, regardless of their location.

When a job utilizing these valves is to be installed, the valve bodies only are first furnished to the contractor for installation in their proper positions in the pipe lines. As soon as the piping work is completed and in position, a corrected plan showing the actual installation is sent to the manufacturer by the contractor and the exact resistance required for each radiator is then figured by an expert engineer.

From these calculations tubes are made up with the necessary orifices and baffles required to set up the desired resistance and the plans are returned to the contractor with each radiator numbered. As soon as the tubes are ready, each tube is given a number to correspond with the number of the radiator which has been marked on the contractor's plan, and the tubes are then delivered to the contractor, ready for installation.

All that is necessary for the heating contractor to do is to remove the union-type bonnet from the radiator valve, drop the tube for that particular radiator into place, and replace the bonnet. The system is then ready for operation.

The manufacturer of this valve is ready to guarantee a balanced circulation to each radiator when these valves are used throughout the system.

Tag-Mono-Duplex Automatic Indicator Recorder

A recorder for indicating and recording in a permanent manner the CO and CO_2 constituents in flue gas has been brought out by the C. J. Tagliabue Mfg. Co., Brooklyn, N. Y.

While really a re-design of the old Mono-Duplex-Recorder, the instrument is practically a new device and may be described as having a large illuminated dial at the top with two pointers arranged one behind the other. When the black pointer covers the red, there are no unburned gases passing up the chimney. If, for any reason, unburned gases are generated, the red indicator immediately shows and it is claimed can be seen for a distance of 50 ft.

Tag-Mono-Duplex CO and CO_2 Indicator Recorder

Permanent records of the CO and CO_2 are made in red ink on the usual circular chart printed in green ink. A plain, practically level line around the chart indicates CO_2 and the presence of unburned gases is indicated by fluctuations appearing on the line. The chart divisions are unusually large, being 1/6 in. for each 1%.

This recorder is guaranteed accurate to within 1/2 of 1% and requires no electricity, water, steam or air as a motive power.

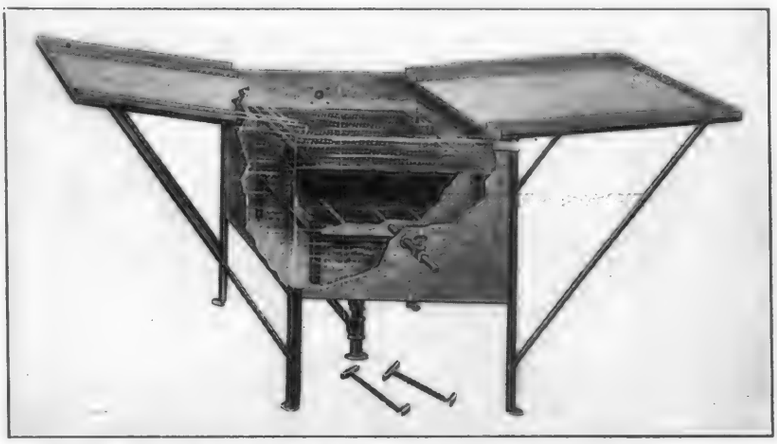
Reed Steam Cleaning Tank for Washing Air Filter Units

A new device to facilitate the cleaning of air filter sections by means of steam and hot water, without the human element entering into the operation beyond placing and removing the sections to be washed, is announced by the Reed Air Filter Co., Louisville, Ky.

This apparatus will be known in the trade as the Reed steam cleaning tank and is said to clean a filter section in from 1½ to 2 minutes with a uniformity of cleaning impossible to obtain with the manual method.

The cleaning tank consists of a galvanized-iron box with drain boards on each side, the whole being stiffened with angle iron. Inside of this box is a smaller box in which the filter section is placed. This smaller box is raised a few inches above the bottom of the large box and supported on angle legs; in the bottom of the smaller box is a perforated iron grid which serves the double purpose of furnishing a support for the filter sections being washed and of providing a means for the entrance of steam into the water through perforations in the grid. The grid, of course, is connected to the steam pipe through a valve.

Live steam is introduced through the perforated grid and confined in an inner casing which supports the filter unit. This arrangement forces a large volume of boiling water up through the filter, creating violent turbulence and effective cleansing action. The steam grid is so designed that it will operate on any steam pressure from as low as 2 lbs.,



Reed Steam Tank For Cleaning Air Filter Units

which is available in the average steam heating system, to the higher pressures usually found in industrial plants. It is said to be possible to clean as many as 10 or 12 units in one tank of water and that the last filter leaving the tank will be just as clean as the first.

While designed primarily for Reed filters, this cleaning tank may be used for other types of unit filters of similar design.

Problems Before Heating Industry Discussed at Secretaries' Conference

Labor conditions, the proposed piping code for Ohio, certified heating, cooperative advertising, training for the steamfitting trade, commercial arbitration, State laws on separate specifications for mechanical equipment, the question of proper channels for the distribution of heating materials, the time and place of the next convention, and methods used to increase attendance at meetings were some of the subjects discussed at the Secretaries' Conference of the Heating and Piping Contractors National Association, held at headquarters in New York, December 6-7. The conference was a two-day affair.

It was decided that no power piping codes should be supported until the Sectional Committee on Uniform Power Piping Code of the American Engineering Standards Committee had submitted its report on the subject.

New York Steamfitters to Remove Labor Shortage

Through an agreement reached between the contractors and the steamfitters and helpers union of New York City, the union agrees to supply the demand for its class of labor. This is the result of conferences between a committee appointed by the New York State Industrial Survey Commission and a committee representing the contractors and labor unions involved.

After several conferences the commission was advised that an agreement had been reached by William Keanelly of the Progressive Association of Steamfitters' Helpers, William J. Bonner of the Enterprise Association of Steamfitters and Henry B. Gombers, secretary of the Heating and Piping Contractors Association.

Assemblyman Jaspar, chairman of the commission, congratulated his committee for its success in bringing this matter to a satisfactory outcome. The committee acting for the commission consisted of Emanuel Koreleski, James W. Gerard and Merwin K. Hart.

Invisible Radiator Story Told in Unique Photographic Catalog

Evidence of the new art in invisible radiator construction and installation is furnished in a striking catalog, A. I. A. File Number 30 C 4, made up of a series of photographic reproductions of details of the Herman Nelson invisible radiator, as manufactured by the Herman Nelson Corp., Moline, Ill. The photographs include views of the progressive steps which are taken in building operations to permit the installations of these units, from the roughing-in to the completed installation.

As is brought out in the catalog, these radiators are designed for installation in any standard 4-in. wall or partition. The radiator itself is 3¼-in. deep and consists of a wedge-shaped cast-metal core, upon which are mounted copper plates or fins. An idea of the radiator's

Progressive Steps of Installation, Herman Nelson Invisible Radiator

indestructibility is furnished in the statement that typical units have repeatedly undergone the test of being filled with water which has been allowed to freeze solid. After thawing, the radiator has shown no damage although subjected to over 200 lbs. steam pressure. Size 5¾-in. by 4-in. 9 sheets (loose leaf).

Willis H. Carrier President of A. S. R. E.

New officers for the coming year were elected by the American Society of Refrigeration Engineers at its twenty-second annual meeting, held at the Hotel Astor, New York, December 6-8.

Officers elected consisted of: President, Willis H. Carrier, Carrier Engineering Corp., Newark, N. J.; vice-president, A. J. Wood, Pennsylvania State College, State College, Pa.; treasurer, W. M. Whitten, Armstrong Cork and Insulation Co., New York; secretary, W. H. Ross, 35 Warren St., New York.

Directors for 1927 are as follows: A. J. Authenrieth, F. M. Fuller, H. Harrison, H. P. Hill and L. H. Roller.

Associated Business Papers, Inc., New York, announces the resignation, as executive secretary, of Jesse H. Neal. Mr. and Mrs. Neal are leaving on a six months' Mediterranean cruise, January 26. The executive committee has decided not to appoint a successor to Mr. Neal as executive secretary but to create a new office in the association, that of managing director. The routine work in the secretary's office will continue to be handled by Mr. Harris, who has been Mr. Neal's assistant. Frederick M. Feiker, who is widely known in industrial circles as former assistant to Secretary of Commerce Herbert Hoover, has been appointed managing director and plans have been laid for widening and diversifying the activities of Associated Business Papers, Inc. The headquarters of the association are now located at 52 Vanderbilt Ave., New York.

Trenton, N. J. The new gas rates filed by the Public Service Electric and Gas Company with the State Board of Public Utility Commissioners at Trenton contains a new uniform rate which will materially lower the cost of gas used for house heating. The new rate consists of a *demand* charge and a *commodity* charge. The demand charge is effective from October 1 to April 30 and, in the case of steam heating apparatus, is $0.30 per square foot of radiation, while for hot water, it is $0.18¾ per square foot of water radiation. Provision is also made for warm-air apparatus of $0.18¾ per square foot of basement pipe area. This demand charge is to be paid in seven equal monthly installments during the heating season. The commodity rate is $0.80 per 1000 cu. ft. consumed, whereas formerly the charge was a sliding scale commencing at $1.20 per 1000 cu. ft. and graduating down to $0.85 for all consumption over 800,000 cu. ft. The new rate became effective January 1, 1927.

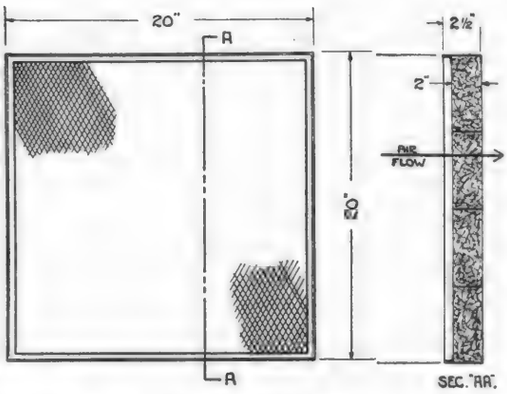
New Trade Publications

HOT WATER QUICK! is the designation of a new folder issued by the Kewanee Boiler Co., Kewanee, Ill., and covering the production of hot water by means of various Kewanee devices, such as garbage burners and various designs of Tabasco magazine-feed water heaters.

WHAT USERS SAY OF ADAMANT FIRE BRICK CEMENT is the name of a booklet issued by Botfield Refractories Co., Philadelphia, Pa., and devoted mainly to testimonials from satisfied users of this cement. The catalog also offers suggestions for obtaining longer service from fire brick, and the proper manner in which to use Adamant cement. Size 6 x 9 in. Pp. 15.

ILG MOTOR-DRIVEN FANS, BLOWERS, UNIT HEATERS AND AUTOMATIC SHUTTERS is the title of a comprehensive loose-leaf catalog issued by the Ilg Electric Ventilating Co., Chicago. This catalog contains information on the construction and design, as well as dimensions and prices, of direct-connected blowers, belted blowers (single and double width), pressure blowers, forge blowers, Type "P" blowers and Type "V" volume blowers. Following this material is descriptive matter on self-cooled motor-propeller fans, Ilgair fans for residences, portable floor fans, farm fans, portable fans, fan guards, propeller fan guards, automatic shutters, power roof ventilators, Ilgair unit heaters, air washers and humidifiers. Examples of Ilg installations are shown and several pages of mechanical data are included in the miscellaneous tables at the end of the book. Size 5½ x 9 in. Pp. 208.

REED FURNACE AIR FILTER is the title of a little folder issued by the Reed Air Filter Co., Inc., Louisville, Ky., and devoted to the furnace air filter. This attachment is essentially a Reed dry air filter unit. It is furnished in two sizes, each having the same area and capacity, the two sizes being for the purpose of making installation easier in various-sized furnace boots. Typical installations in both a gravity warm-air furnace and in a fan-operated scheme are shown. On the back of the folder are illustrated two views of the dust comparator, one having been placed in front of the filter and the other behind it, for a period of twenty-four hours.



Reed Furnace Air Filter

BARBER PATENTED JET GAS BURNERS is the name of a pamphlet issued by the Cleveland Gas Burner & Appliance Co., Cleveland, O., which covers gas burners for almost any use. Applications of these burners to warm-air furnaces, round steam and water boilers are fully illustrated. Capacities of burners, the size of grate for which they are suitable, list prices and discounts are included. Size 6 x 9 in. Pp. 12.

O-E BOILER CLEANSER AND PRESERVATIVE is the subject of a small folder issued by the O-E Specialty Mfg. Co., Milwaukee, Wis. The folder explains that the preservative is a neutralizing vegetable cleaning agency and protective liquid, which is odorless, tasteless and harmless. It is stated that the preservative, when applied to heating boilers, will stop foaming and priming, result in a steady water line, precipitate impurities and stop corrosion. Directions for use are included.

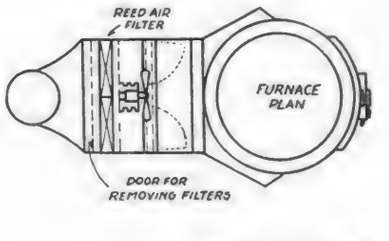
AIR CONDITIONING AND HEAT CONTROL by A. W. Lissauer, chemical engineer, is the title of a booklet being circulated by the Cooling and Air Conditioning Corp., New York. This is a reprint of an address delivered before the twenty-second annual convention of the Biscuit and Cracker Manufacturers' Association of America, May, 1922. This discussion covers the application of air conditioning in large bakeries and the various processes arising in this industry. Size 6 x 9 in. Pp. 11.

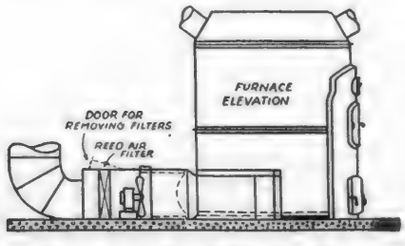
A REMARKABLE COMPARISON, issued by the General Boilers Co., Waukegan, Ill., is the title of a folder illustrating the comparison between two buildings of identical construction and size, built side by side, by the same contractor, under the same specifications, and even with their respective boilers fired by the same man, one being a Pacific up-draft smokeless boiler and the other, a down-draft boiler of ordinary fire-box return tubular type. The coal cost is stated to be over 28% in favor of the Pacific up-draft smokeless boiler, this boiler using 122 tons of screenings, at $7.60 per ton, between October 9, 1925 and March 26, 1926, while the other boiler used 154 tons of lump coal, at $8.40 per ton, during the same period.

PROTECT YOUR PLANT AND EQUIPMENT is the slogan printed on the outside of a little pamphlet issued by the Quigley Furnace Specialties Co., Inc., New York. This booklet describes the dangers of corrosion and the application of Quigley Triple A solution. It is recommended to use first one coat of black solution, regardless of the final color, and then two coats of the final color desired, except when the final coat is to be white, in which case a second coat of buff is suggested. Size 3½ x 6 in. Pp. 23.

STURTEVANT PNEUMATIC COLLECTING AND CONVEYING SYSTEMS is the designation of the 1926 edition of Sturtevant Bulletin No. 291, covering apparatus used in these systems, as well as their design and application. Part One includes apparatus for dust collecting, pneumatic conveying, and the advantages to be obtained from the use of such systems for handling fibrous materials and dust from various sources, such as sand blasts, tumbling barrels, and grinding and polishing wheels. Part Two contains useful data on the design and application of collecting systems, engineering methods of design, friction losses, sizing of connections for various apparatus, slow-speed fan performances and other miscellaneous tables. Size 8 x 11 in. Pp. 72.

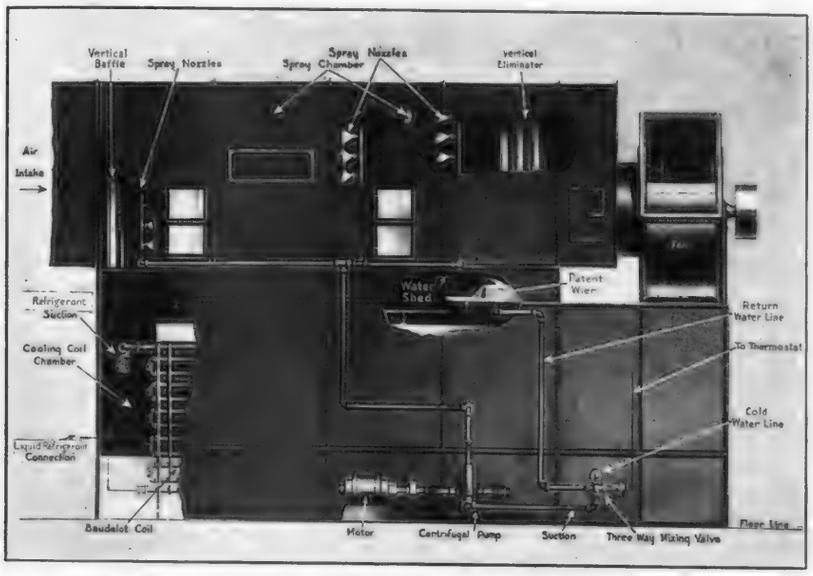
AIR CONDITIONING SYSTEMS is the name of the new catalog, No. 127, of the Cooling and Air Conditioning Corp., New York, successors to W. L. Fleisher & Co. and the Ross Engineering Co.



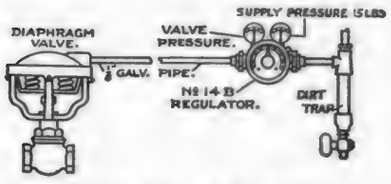


Application of Reed Filter to Furnace

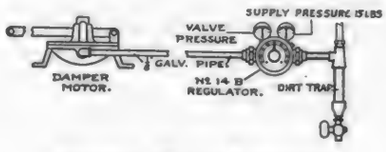
Automatic Regulator Used on Cooling and Air Conditioning Corporation's Apparatus



Assembly of Fan, Refrigeration and Dehumidification Apparatus of the Cooling and Air Conditioning Corporation



Regulator and Valve Assembly



Damper Motor Assembly

This publication discusses air conditioning and fields where it may be applied; apparatus necessary and the control of temperature and humidity; duct systems and the use of dehumidifying with refrigeration and insulation. This is followed by tables on relative humidity, together with the Bulkeley psychrometric chart. Size 8 x 11 in. Pp. 50.

POSITIVE WATER-LINE CONTROL IN LOW-PRESSURE HEATING BOILERS is the heading on a folder issued by W. D. Cashin Co., Boston, Mass. This four-page publication outlines the Cashin automatic boiler-feeders in both non-overflow and duplex types as well as the Thermoflex graduated radiator valve and Thermoflex No. 1 radiator type.

WASTE HEAT BECOMES VISIBLE AS LEAKING STEAM is the designation of a folder put out by the Foxboro Co., Inc., Foxboro, Mass., and devoted to flue-gas thermometers of both one-pen and three-pen types. The three-pen thermometer not only records flue gas temperature, but also two boiler-feed temperatures, one before, and the other after passing through the economizer.

WHY THERMOSTATIC? is the interrogation on the face of a small but ingenious folder sent out by the Sarco Co., Inc., New York. This little folder, when opened up, causes the upper portion of a Sarco trap to jump up at the reader, in a manner usually ascribed to the Jack-in-the-box. The lower portion of the trap is carried on the folder proper. The text is devoted to an explanation of why the thermostatic trap is to be preferred, and enlarges on the principle, size and capacity of the No. 9 trap.

ENGINEERING ACHIEVEMENTS OF THE WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., Pittsburgh, Pa., for the year 1926, is the title of a pretentious publication prepared by H. W. Cope, assistant director of engineering. As indicated in the title, this book is devoted to notable work in which the Westinghouse company has been concerned during the past year. It is profusely illustrated and gives a good idea of the magnitude and variety of problems annually attacked by this organization. Size 8½ x 11 in. Pp. 43.

BOILER GRIEF is the designation of a folder on the W. J. Boiler and Heating System Cleanser, which is distributed by John G. Kelly, New York. This cleaner is stated to be free from acid and all other ingredients injurious to metal, and is claimed to act on the boiler as a dissolvent for oil and grease and as a disintegrater of core sand, scale, rust and other impurities.

LOOK AT YOUR HEATING TROUBLES THROUGH THESE GLASSES is the arresting title of a folder issued by the Vinco Co., Inc., New York, relating to the use of Vinco in boilers. Two phantom views of a boiler are shown, one with clean water and steady water-line, while the other illustrates a boiler with dirty water and the foaming and fluctuating water-line resultant. Vinco is stated to be not a solution of soap or oil, and neither acid nor alkaline. It is described as an insoluble, non-volatile absorbent which stays in the boiler, where it belongs. Quantities of Vinco required are given as ranging from 3 lbs. up to 350 sq. ft. of radiation, to 30 lbs. for 4000 to 5000 sq. ft. of radiation. Above this, 1 lb. additional is used for every increase of 300 sq. ft.

A NEW PLANT, followed by the smaller note, "Doubles the Service Facilities Behind Pacific Boilers," occupies the entire front page of a folder issued by General Boilers Co., Waukegan, Ill., and the Pacific Steel Boiler Corp., Bristol, Pa. The two inside pages of the folder show views of the new plant at Bristol, Pa., as well as the No. 1 plant at Waukegan, Ill., and describe the increase in capacity resulting from the completion of the Bristol plant.

TYPE "SE" STEEL PLATE BLOWER is the subject of bulletin No. 2004, issued in October, 1926, by the American Blower Co., Detroit, Mich. This bulletin describes the construction of this type of blower and includes complete dimension and capacity tables. Bulletin No. 8001, dated November, 1926, covers Sirocco fans and blowers and supersedes Bulletin No. 1801. Detailed descriptions are given of Sirocco fans, together with capacity, R.P.M., tip speed and brake horsepower tables. In conclusion, dimension diagrams and tables for all sizes of Sirocco fans are presented. Size 8½ x 11 in. Pp. 80.

MERCOIDS, the monthly message of The Federal Gauge Co., Chicago, in its last issue, features an interesting thought in connection with the oil burner and allied industries, under the title "What of To-morrow?" by Byron K. Eaton, general sales manager of the Winslow Boiler & Engineering Company.

Mr. Eaton prefaces his analysis of the sales situation with the statement that 40% of the annual oil-burner sales to the home-owner is consummated during a period of 90 days. The most vital problem facing the industry is, as he sees it, "How will we flatten the sales curve?"

Sales can be made consistenly throughout the entire year, in any part of the country, and are being made by those aggressive agents who will not be stopped even by a blizzard. What one can do another can, and Mr. Eaton believes that a concerted sales effort by all hands and the cook will result in making oil-burner sales more uniform throughout the year.

DYNAMICALLY BALANCED, the title of a circular issued by Janette Mfg. Co., Chicago, applies to the armatures of the fractional horse-power motors made by this company, particularly for uses in the oil-burner and household-refrigeration field. As a result of this balance, made while the moving element is rotating at its designed speed, a nail will remain standing on its head on the motor casing of a fan unit for oil-burner use, and a coin can be stood on edge on the motor of a Monroe oil pump while the motor, at 1750 r. p. m., is operating a double-piston pump. These features are pictured in the circular which incorporates a post-card request for engineering data on Janette motors.

Present Accepted Practice in Domestic Oil Burners

25—Hardinge. *Rotating Atomizer, Mechanical Draft, Gas Ignition*

Previous articles in this series are:

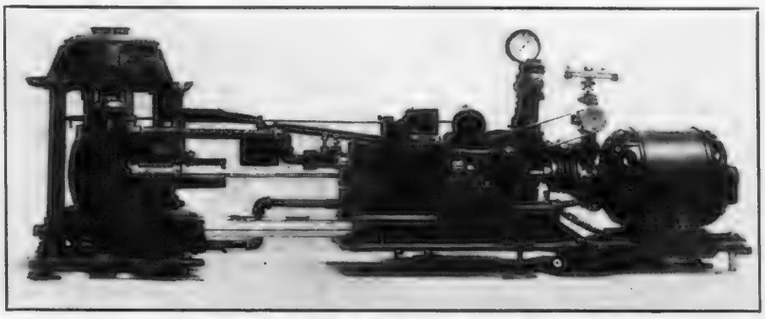
1. *Kleen Heet, July*, 1925.
2. *Baker, July*, 1925.
3. *Kerrihard, July*, 1925.
4. *Silent Glow, August*, 1925.
5. *Aetna, August*, 1925.
6. *Caloroil, September*, 1925.
7. *Oil-O-Matic, September*, 1925.
8. *Chalmers, October*, 1925.
9. *Hart, October*, 1925.
10. *Sun, October*, 1925.
11. *Rayfield, November*, 1925.
12. *A. B. C., November*, 1925.
13. *Electrol, December*, 1925.
14. *Grant, January*, 1926.
15. *Nu-Way, January*, 1926.
16. *Wayne, February*, 1926.
17. *May, February*, 1926.
18. *Ray Rotary, March*, 1926.
19. *Super Oil Heater, May*, 1926.
20. *Nokol, July*, 1926.
21. *Johnson, August*, 1926.
22. *Arrow, September*, 1926.
23. *Safe Fire, October*, 1926.
24. *Sword, November*, 1926.

25. Hardinge.

THE Hardinge fuel-oil burner, designed and built by Hardinge Bros., Inc., Chicago, Ill., is the result of fourteen years of oil-burner development work. The firm itself has been in business more than a third of a century, as a manufacturer of precision machinery and watchmaker's tools. The Hardinge burner has been in the field of service for eight years and is made in 22 different sizes in both automatic and manual types for domestic and industrial use.

The Hardinge oil burner is known as a flat-flame type burner. This method of combusting oil makes a very quiet flame. The atomization of the oil is accomplished by the use of a vertical chalice-shaped atomizer located in the centre of the combustion chamber at the grate level. The atomizer revolves at a speed predetermined by its diameter.

Oil is brought to the bottom of the atomizer by a gear pump and centrifugal force carries it to the edge from which it is sprayed into the combustion chamber in the form of a mist. It is mixed with primary air generated by a number of fan blades which are an integral part of the atomizer. The secondary air is taken into the combustion chamber underneath an adjustable air ring and helps to hold the oil-gas in suspension while burning.



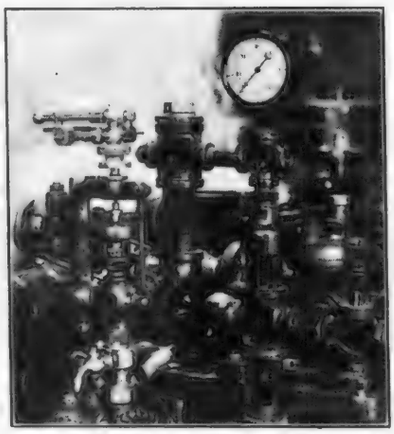
A Cut-Away Hardinge Oil Burner

BOTH PRIMARY AND SECONDARY AIR ADJUSTABLE

The adjustable air ring may be raised or lowered to permit more or less primary or secondary air to enter the combustion chamber. This is done so that the burner may be adjusted to meet the draft conditions that are found in the different stacks and chimneys. The primary air is sucked into the fan blades, while the secondary air is the result of natural draft. The oil is burned in a round combustion chamber made of a high heat-resisting material. The diameter and height of this chamber are determined by the size of the atomizer.

The fuel for operation of the burner is drawn from the supply tank by a gear-type pump and passes first through a large strainer to the pump and is then put under pressure of 12 lbs. to 15 lbs. by means of an adjustable relief valve in the return line to the supply tank. This pressure forces the oil through another smaller and finer mesh strainer, through the feed valve into the oil line, to the oil nozzle. From that point it is sucked up by the atomizer.

In passing from the feed valve to the nozzle, the oil must pass through an oil valve that is opened and closed by a governor located on the drive shaft of the machine. This governor is actuated by the speed of the motor, shutting off the oil supply to the nozzle when stopped, and opening the valve only when the machine has attained its designed speed.



The Oil Valve When Used for Intermittent Operation

Attachment to Oil Valve When Used for High-Low Operation

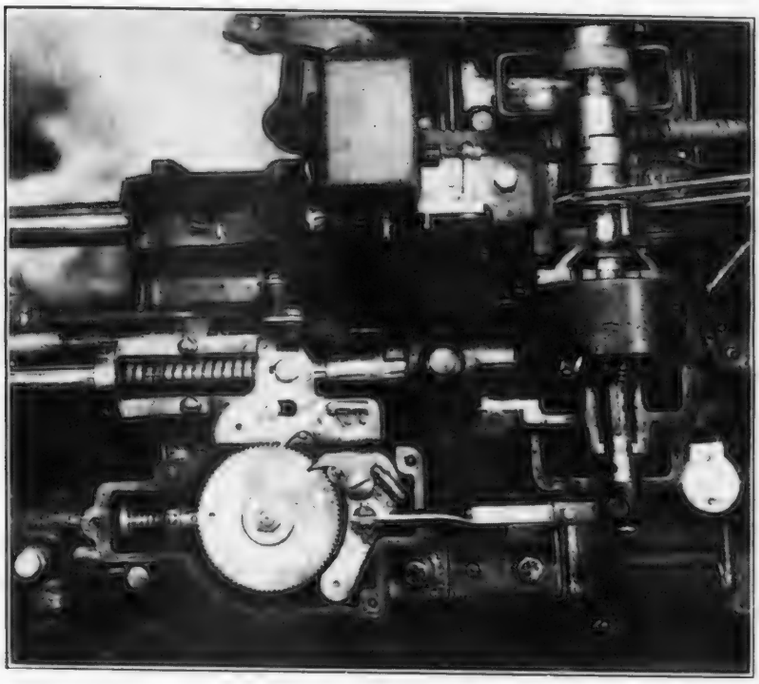
The oil-feed valve is a hollow stem with a small orifice in the side through which the oil is forced. It is in turn inserted in a sleeve, so that by raising and lowering the stem, by means of a hand lever attached to the top of the stem, the orifice is closed or opened, thereby increasing or decreasing the supply of oil to the burner.

EXPANDING GAS PILOT IS ACCURATELY CONTROLLED

Ignition is by a gas pilot controlled by an automatic gas valve of the ratchet type and is so constructed that it gives a full expansion of gas over a period of 30 seconds each time the burner is started. This is accomplished by the action of the governor releasing a ratchet-tooth gear and cam. The cam releases a plunger, thereby opening the gas port to its full capacity and also engages a ratchet driven by the pump shaft, which rotates the ratchet-tooth gear and cam back to its starting position, thereby closing the large gas port and allowing the gas to burn only from the small adjustable by-pass valve.

BURNER BUILT IN TWO TYPES

The Hardinge burner is built in two types, the full automatic, which, as



Looking Down on the Hardinge Burner, Showing Gas-Control Valve, Governor and Oil Pump

described above, is operated on the intermittent principle, with gas ignition. This is controlled by room thermostat and also by boiler safety control.

What is termed the semi-automatic burner is designed for continuous operation, or more commonly called, "high-low." For this operation, the quantity of oil sent to the burner is automatically changed between two extremes through the room thermostat and there is also inter-connected a safety boiler control. When this burner is installed, the maximum flame under the existing conditions and also the minimum flame for satisfactory operation are determined and stops are set at these points, between which the burner is operated.

SAFETY CONTROL

There are two safety controls, the first being a drip-bucket draining from the combustion chamber, and the second, a sump, which is buried in the concrete of the boiler-room floor. The first performs in the ordinary fashion and the second and larger sump is designed not only to act as a safety in case of oil leakage around the burner or anywhere in the cellar, but also to provide against damage to the burner in case of a flooding of the cellar with water. A small quantity of any fluid in this sump will automatically shut off the current supplied to the motor and the sump must be emptied before the burner can be operated.

The burners are made in twenty-two different sizes and models and have a range of from 800 sq. ft. to 4500 sq. ft. of direct steam radiation for the full or semi-automatic burners, and from 4500 to 20,000 sq. ft. of direct radiation for the semi-automatic and industrial burner. There are twelve different sizes of atomizers between 3-in. and 10-in. diameter and these are driven at proper speeds between 4200 R.P.M. and 3000 R.P.M. to secure the desired degree of atomization. The Hardinge burner is listed by the Underwriters to burn fuels not heavier than 28° A.P.I.

Underwriters' Analysis of Oil-Burner Fires

In connection with the tabulation of oil-burner fires reported by insurance patrols, which was presented in last month's issue, it is to be noted that practically 60% of the fires were caused by one of four defects of burner or of operation; failure of automatic shut-off valve, carbonization, defective burner, or leaky piping, due to loose connections. The first-named cause was responsible for more fires than any other item—39.

Of the 74 fires from other causes, 10 were the result of *absence* of an automatic shut-off valve; in other words, the burners were not "listed". Seven fires resulted from the absence or extinguishment of a pilot light and the other 57 varieties were the result of 20 different causes. Nine fires resulted from imperfect combustion.

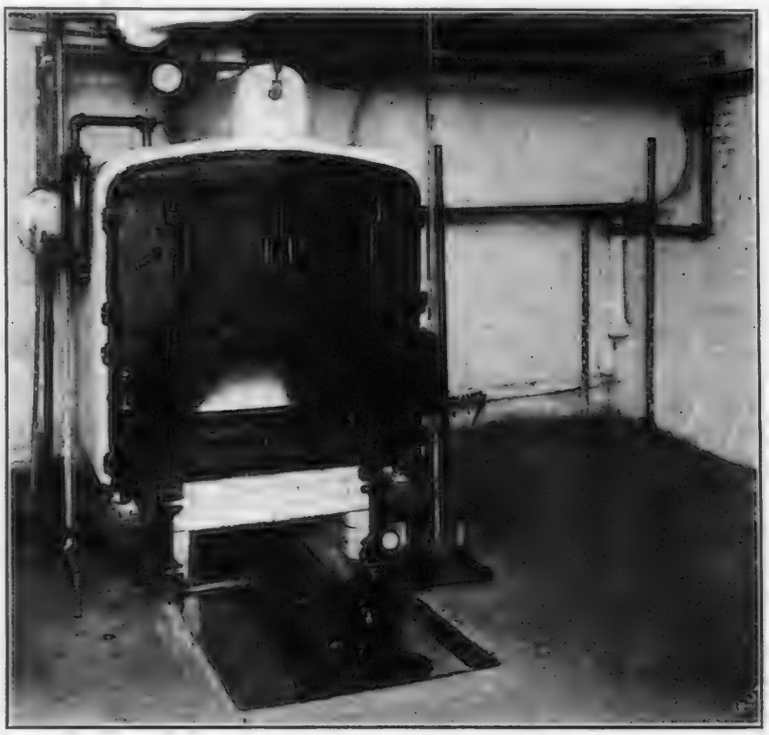
The foregoing is presented to clarify a paragraph which was transposed in last month's issue.

Coal Merchant Takes on Oil Burners

"Give the people what they want" is the thought which induced I. E. Jackson, of the City Fuel Co., Cedar Rapids, Ia., to combine the sale of oil burners with his coal business.

Seeing the handwriting on the wall when some of the company's best customers began dropping off, one by one, owing to their going in for the use of oil, Mr. Jackson decided that, if his customers were going in for oil, there was nothing for him to do but satisfy the demand.

Two burners were selected, one a nationally-advertised burner of high class, and the other a cheaper, but approved, burner for small work, retailing for about $300 less. Following the



A Typical Hardinge Installation

same scheme he had used in the coal business of supplying various grades of coal, he arranged to supply an assortment of oil burners.

The result is that Mr. Jackson is selling coal to coal-users and oil burners to those who want oil burners, showing that his business judgment was not only sound, but profitable.

Miniature Demonstrator of Furnace Overcoats

A visual exhibition of a miniature model has been found a most valuable aid in making sales by the Minwool Insulating Co., Kalamazoo, Mich. This company is marketing a product known as the "Minwool Furnace Overcoat" and has worked out a device which allows the whole proposition to be demonstrated in the living room or parlor, if desired.

The demonstrator is contained in a neat, compact carrying case, considerably smaller than the ordinary suitcase. The top and front of the case can be quickly opened, bringing to view two miniature warm-air furnaces. These are identical in construction, being made of standard-weight galvanized-iron and equipped with two cold-air pipes entering at the base and two warm-air pipes opening from the tops of the furnaces.

Each furnace is heated by a single electric lamp bulb and the furnaces can be lifted off of the lamps in order quickly to convince the prospect that they are identical and that no subterfuge is employed to accomplish their purpose.

One of the furnaces is bare or uninsulated, while the other is covered with standard-thickness Minwool from which the "Minwool Furnace Overcoat" itself is built up.

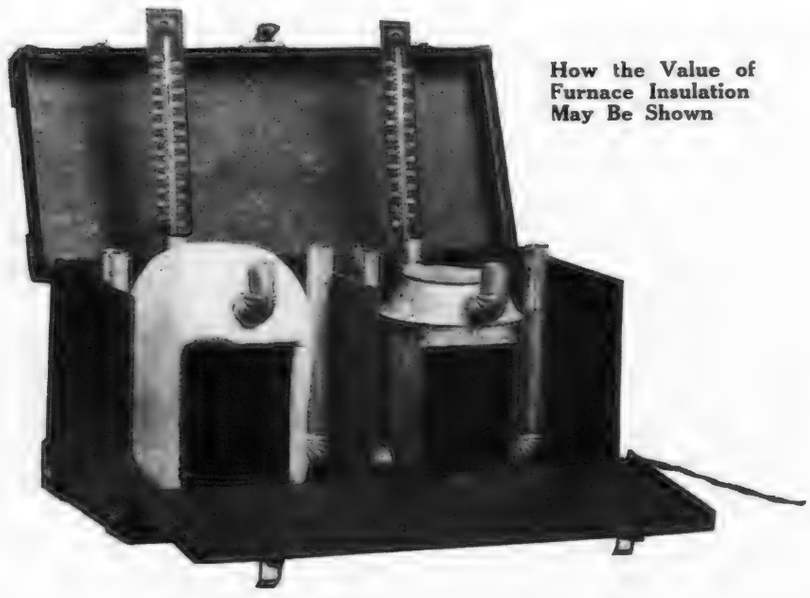
The cord leading from the electric lamp is connected in a convenient socket and a thermometer placed in one of the warm-air pipes leading from each furnace. The effect of the insulation is demonstrated very clearly in two ways; first, by the temperature of the air leaving the two furnaces, and, second, by the outside temperature of the furnaces themselves.

The warm air leaving the insulated furnace proves to be in the neighborhood of 40° higher than the air leaving the uninsulated furnace, and while the Minwool covered model is perfectly cold on the outside the uninsulated model is found to be uncomfortably hot when touched with the hand.

With such an effective demonstration of the efficiency of the insulation where only the heat of a single electric lamp is employed, there is no trouble whatever in exciting interest on the part of the prospect in his own problem which involves a furnace carrying a roaring fire.

In addition to this demonstrating equipment the outfit includes a small alcohol blow-torch which the salesman uses to prove the heat and fire-resisting qualities of Minwool by placing a small piece in his hand and directing the flame toward his palm.

An effective demonstrating equipment has always been the goal of sales managers and this object has been accomplished in this little outfit which combines compactness, portability, cleanliness and effectiveness.



How the Value of Furnace Insulation May Be Shown

World's Deepest Gas Well at Ligonier, Pa.

A gas well 7,756 ft. deep has been drilled by the People's Natural Gas Company on the Lincoln Highway, near Ligonier, Pa. This well required over three years to drill and is claimed to be the deepest gas well in the world.

Central Station Heating Notes

Kalamazoo, Mich. Central heating was defeated here by a vote of 2,236 against 399. This vote was on the matter of granting a 30-year franchise to William Shakespeare, Jr., to build and operate a central heating plant. Claims were advanced that such a plant would reduce the fire hazard and abate the smoke nuisance. Only 12% of the registered vote participated in the election.

Bremerton, Wash. A central district heating plant has been inaugurated in Bremerton, where the city commissioners have granted a franchise for the use of streets for carrying pipes. After this franchise has been formally ratified by popular vote, matters will be ready to proceed. The intention is to start with an installation costing approximately $100,000 and later gradually to expand until all the downtown business blocks can be served. Financial backing for the enterprise, it is stated, has been secured.

Business Removals

Eadie, Freund and Campbell, consulting engineers, announce their removal from 7 West 45th Street, New York, to 110 West 40th Street. The firm, consisting of John Garretson Eadie, M. E., Mortimer Freund, E. E., and James K. Campbell, S. B., will continue to conduct a consulting engineering business on building equipment and industrial plants.

May Oil Burner Corporation, Baltimore, Md., announces the removal of its offices to 3500 E. Biddle Street, Baltimore.

Iron Fireman Corp., Chicago, has removed its sales office and service department to 572 West Randolph Street, corner of Jefferson Street, and one block from the C. and N.W.R.R. station.

Business Opportunities

L. Bamberger & Co., Newark, N. J., is about to erect an addition to its department store, which, it is expected, will cost in the neighborhood of ten million dollars. This new structure will be located immediately north of the present building and will be most modern in every respect. Jarvis Hunt, Chicago, has been selected as architect and Martin Schwab, consulting engineer.

F. R. Patterson Construction Co. Detroit, Mich., construction of new Ford administration building at Schaeffer and Maple Roads, Fordson. The building contract alone will amount to about $1,200,000 and, including equipment, will reach $1,500,000. Albert Kahn is the architect.

Trade and Miscellaneous Notes

Coming Events

January 18-20, 1927. Third Annual Three-Day Institute for Plumbing and Heating Industries at Carnegie Institute of Technology, Pittsburgh, Pa.

January 25-28, 1927. Annual meeting of American Society of Heating and Ventilating Engineers in St. Louis, Mo. Headquarters at Hotel Statler.

February 1, 1927. Opening of permanent International Trade Exhibition, Exhibition Building, New Orleans, La.

February 15-19, 1927. Chicago Power Show, Chicago, Ill.

February 15-17, 1927. Forty-first annual meeting of Engineering Institute of Canada. Opening session in Montreal at the Institute headquarters, January 27, with adjournment to reconvene at Quebec, February 15, 16 and 17.

February 19-26, 1927. New York Annual Own-Your-Home Exposition, Madison Square Garden, New York.

February 21-March 5, 1927. Second Architectural and Allied Arts exposition, under the auspices of the Architectural League of New York, Grand Central Palace, New York. Executive offices, 105 West 40th Street, New York.

March 14-19, 1927. Second National Heating and Ventilating Exposition at Twelfth Regiment Armory, Columbus Avenue, 61st to 62nd Streets, New York.

April 2-9, 1927. Chicago Seventh Annual Own-Your-Home Exposition, Coliseum, Chicago, Ill.

April 5-7, 1927. Annual convention of American Oil Burner Association, in Buffalo, N. Y.

May 10-13, 1927. Eighteenth annual convention of National District Heating Association, West Baden, Ind. Headquarters at the West Baden Springs Hotel.

June 6-11, 1927. Annual convention of National Electric Light Association, Atlantic City, N. J.

Miscellaneous Notes

November Construction contracts in 37 States east of the Rocky Mountains, according to the F. W. Dodge Corporation's review of construction activities, amounted to $487,000,000. This amount is a decline of 6% under the October contracts, but exceeds November of last year by 3%.

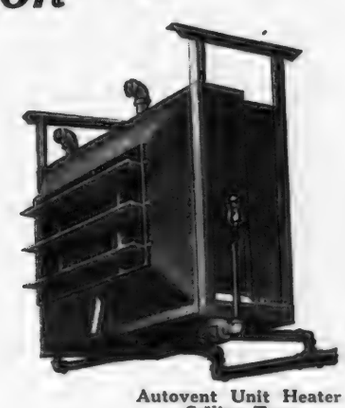
The work awarded consisted of 47% for residential buildings, 13% for industrial buildings, 12% for commercial buildings, 10% for public works and utilities, 7% for educational buildings, 5% for social and recreation projects, 2% for hospitals and institutions and another 2% for religious and memorial structures. Contemplated work reported in the same district for November amounted to $633,191,000.

The New York State and northern New Jersey share of the contracts awarded came to $118,035,100, a decline of 4% under October and 27% from November, 1925. New England had $36,557,200, an increase of 16% over October, but a decline of 1% under November of the year previous. The Middle Atlantic States showed $66,263,700, an increase of 78% over October and 16% over November, 1925. In the Pittsburgh District, the figure was $40,822,500, a decrease of 30% over last year's November record. The Central West amounted to $154,205,000, 10% less than October, but 29% over November, 1925.

In the Southeastern States, the total was $52,534,800, which showed an increase over October of 9%, but a decline of 9% against November a year ago. For the Northwest, the amount was only $5,281,300, a decrease of 40% from the month previous and 10% from November, 1925. Texas had $13,312,000,

"—to express our satisfaction" ★

AUTOVENT
UNIT HEATERS



Autovent Unit Heater
Ceiling Type

**The Superintendent of the St. Paul Garment Co. says:*

"We are writing you at this time to express our satisfaction in connection with the Unit Heater which we have installed in our factory.

"We find that this has greatly helped to even up the temperature over the whole floor by blowing a current of warm air for a considerable distance."

Estimates and prices cheerfully furnished by our Engineering Department.

AUTOVENT FAN & BLOWER CO.
730-738 W. Monroe St., CHICAGO
ENGINEERS IN ALL PRINCIPAL CITIES

which was a reduction of 19% against October, but an increase of 32% over November of the year previous.

New Haven, Conn. The staggering loss of 75,000 lives within the United States in the two months from February 14 to April 15, due to violent and unexpected changes in the weather, is the startling assertion made by Professor Ellsworth Huntington of Yale University. This is only from sharp fluctuation of temperature and does not include losses from disaster, such as the Florida catastrophe, he adds and claims that the coolest cities are the most healthful, having a death rate of only 2.6 per thousand against 5.2 in the warmest ones. Placing an economic value to the nation of $7000 on each life so lost, Professor Huntington computes that the cost of such deaths for the two months period mentioned comes to over $500,000,000.

Pasadena, Cal. George B. Hoffman, president of the Hoffman Specialty Co., Waterbury, Conn., is spending the winter months, accompanied by Mrs. Hoffman, at Pasadena, Cal. Mr. Hoffman recently returned from Europe, after having completed a tour of France, Belgium, Italy and England.

Memphis, Tenn. Members of the Heating and Piping Contractors Memphis Association have endorsed the plan of certified heating for Memphis. George B. Richmond, chairman of the organization, reports that all of the nineteen members in the association are installing nothing but certified heating and as a result, about 90% of all installations being made in Memphis are of the certified variety.

Manufacturers' Notes

York Heating and Ventilating Corp., Philadelphia, Pa., announces that H. P. Gant has assumed the position of vice-president in the organization, effective January 1 of this year. Mr. Gant is a past president of the A. S. H. & V. E. and in 1896 acted as chairman of the society's Research Committee. This change will again bring together Mr. Gant and Thornton Lewis, the latter being president of the company. He and Mr. Gant were previously in partnership for about ten years. For the past few years, however, they have been working independently and friends of both will feel gratified to know that the previous business association has now been renewed.

H. P. Gant

Buckeye Blower Co., Columbus, O., announces the appointment of Harry W. Page as general sales manager. Mr. Page was formerly sales manager for B. F. Sturtevant Co., and Bayley Mfg. Co. William I. Lawson, former general sales manager, has been made general manager of the company. The company also has appointed Alfred A. Driggs district manager for the sale of its products in eastern Pennsylvania and in New Jersey. Mr. Driggs was formerly connected with the Peerless Unit Ventilation Company and has his headquarters in the Military Park Building, Newark, N. J.

McDonnell & Miller, Chicago, Ill., announce the appointment of Warren E. DeYoung as manager of their eastern office, which carries stocks of Duplex water feeders and Duplex switches. Mr. DeYoung's headquarters will be at the company's office, located in the Grand Central Terminal, New York.

Pierce, Butler & Pierce Mfg. Corp., New York, is now occupying its new metropolitan warehouse at 9200 Metropolitan Avenue, Forest Hills, Long

De Bothezat Disc Pressure Fans

used by The Montreal Light, Heat & Power Consolidated

30″ De Bothezat Disc Pressure Fans have been installed in Cedars Power House to clear the switch rooms quickly of the smoke and gases thrown out when the oil switches open under heavy currents.

Each fan has a duty to remove 40,000 cu. ft. of fume-laden air in 4 minutes, and is capable of handling same under extremely adverse conditions. This is due to the fact that **De Bothezat Disc Pressure Fans** are scientifically designed to *develop static pressure*, thereby **overcoming resistance with exceptionally high efficiency.**

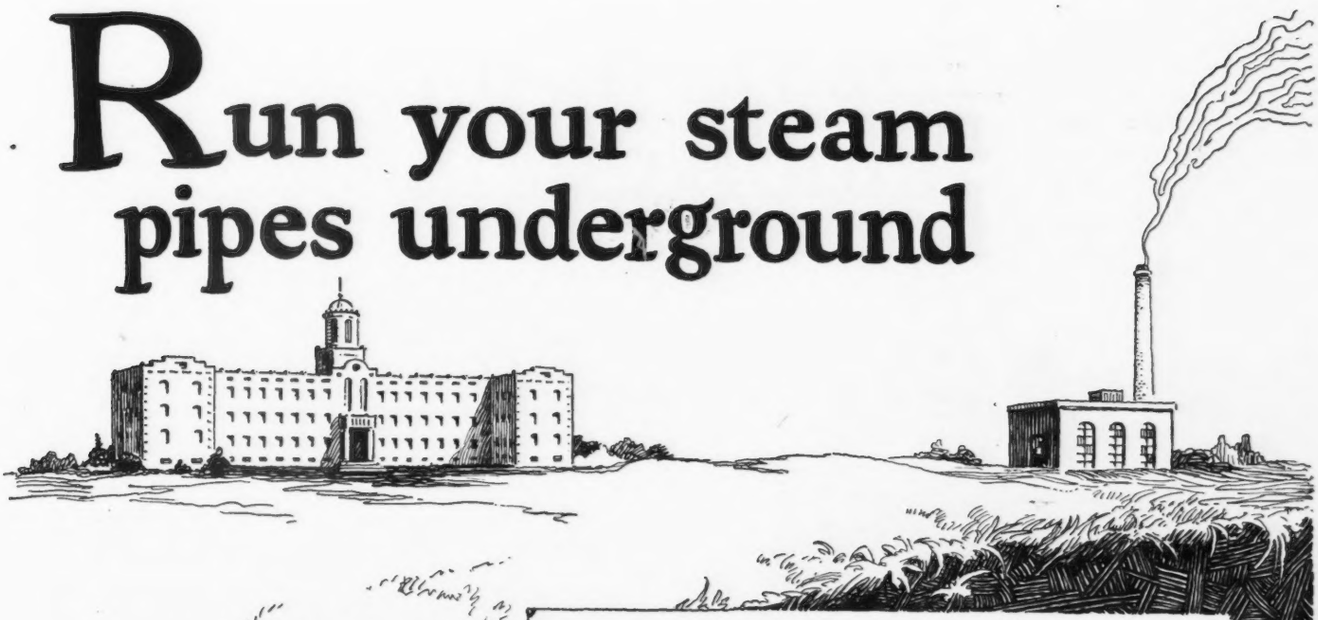
De Bothezat Disc Pressure Fans for Positive Results

Write for Catalog "HV"

De Bothezat Impeller Co.
Incorporated

1922 Park Ave. **New York City**

Run your steam pipes underground



by this economical method

THE Johns-Manville Underground System of Insulation couples an efficient distributing system to the economy of the central power house. The result is maximum economy for the whole.

This method does away with the unsightly appearance of overhead lines and the heavy expense of a walking tunnel.

It has a guaranteed efficiency of 90%. The fundamental design is based on the insulating experience of a company that has been successful for over fifty years. The planning of each specific installation is in the hands of men who have planned many of the largest installations in the country. All construction is supervised by an experienced Johns-Manville engineer.

In this way, careful design, planning and construction are combined to give you a completely satisfactory system.

The above illustration shows component parts of the Johns-Manville System.

JOHNS-MANVILLE Corp., 292 Madison Ave., at 41st St., New York
Branches in all large cities
For Canada: Canadian Johns-Manville Co., Ltd., Toronto

JOHNS-MANVILLE

Underground System of Insulation

Through Asbestos and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

Island. The new quarters include nearly 50,000 sq. ft. of floor area and are in charge of J. J. Weissmiller, manager.

May Oil Burner Co., Baltimore, Md., advises that it has appointed R. C. Hay director of sales and advertising. Mr. Hay has had an extensive experience in merchandising and sales management with the American Radiator Company and is a contributor to the publication press. It is also announced that C. P. Culbert, former eastern district manager of the same company, has been appointed field sales manager, with headquarters at Baltimore.

Trane Co., La Crosse, Wis., has appointed W. F. Bilyeu as sales manager.

W. F. Bilyeu

Mr. Bilyeu was connected with Warren Webster & Co., for a period of sixteen years and during the past two years has been acting as assistant sales manager for the Trane Company. This has brought him into direct contact with agencies from coast to coast which experience has been supplemented by a visit to foreign fields such as England, France, Belgium, Italy and Switzerland.

Richardson & Boynton Co., New York, reports the appointment of H. T. Richardson as a member of the Heating and Ventilating Committee of the "Own-Your-Home" Exposition to represent the National Warm-Air Heating and Ventilating Association.

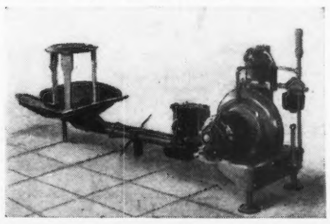
E-Z DAMPER GRIP-TITE Floor Vents

POSITIVE AIR CONTROL AT FLOOR LEVEL

ÆOLUS DICKINSON CO.
3336-44 So. Artesian Ave. CHICAGO
(*Some territory open for agents*)

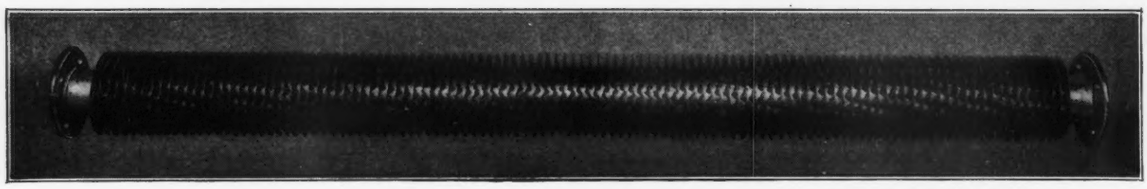
The CHALMERS OIL BURNER

was among the pioneers in the oil burner industry and their present popularity is based on the permanent, satisfactory service they have delivered through the years.



Approved by Underwriters Laboratories. Responsible Representatives will find the Chalmers Agency a profitable one.

CHALMERS OIL BURNER CO.
Minneapolis, Minn.
Member American Oil Burner Association.

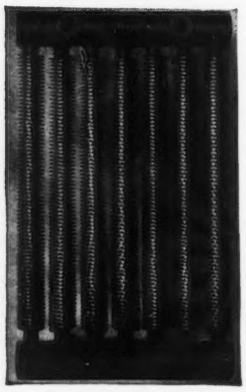


SCHUTTE KOERTING

RADIAFIN TUBES
for heating or cooling air

6 to 10 times as much surface as plain tubes of same size.

6 sizes, ¾ in. to 6 in., lengths up to 15 ft., plain or flanged ends, with or without headers.



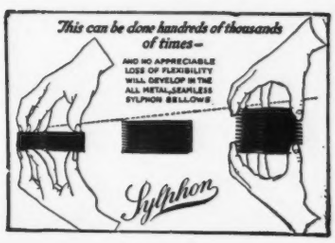
The radial fins insure maximum heat transfer.

We are equipped for quantity production.

SCHUTTE & KOERTING CO., 1153 Thompson St., PHILADELPHIA, PA.

Sylphon TRADE MARK

Hot Water Damper Regulators


This can be done hundreds of thousands of times—
AND NO APPRECIABLE LOSS OF FLEXIBILITY WILL DEVELOP IN THE ALL METAL-SEAMLESS SYLPHON BELLOWS
Sylphon

Cut open view of No. 45-A Sylphon Hot Water Damper Regulator. Controls from 120 deg. to 220 deg. F. Length of bulb 2 inches; threaded 2-inch pipe size. Installed in a Y or screwed into boiler.

No. 46 Sylphon Hot Water Damper Regulator. Controls from 130 deg. to 200 deg. F. Length of bulb 1 inch; threaded 1-inch pipe size. May be screwed into boiler, laundry heater, or garage heater.

Don't Overlook the Opportunity You Have of Installing Damper Regulators on House Heating Water Boilers

A HOT water house heating boiler without damper control is wasteful of fuel, troublesome to the householder, and causes innumerable unnecessary trips up and down stairs to adjust drafts, in an effort to secure even heating.

Install a Sylphon Hot Water Damper Regulator and it will automatically open and close the drafts in *continuous* and *proportionate* response to the slightest changes in the temperature of the water, thereby giving uniform heating conditions.

Like Sylphon Steam Damper Regulators, they contain the well-known, all metal Sylphon Bellows, a diaphragm which guarantees lifelong control without servicing costs.

Just Issued!

Ask for Bulletin WDR-5
and
Our *New* Catalog W-200

Send for a Copy

THE FULTON COMPANY KNOXVILLE, TENN.

ORIGINATORS AND PATENTEES OF THE SYLPHON BELLOWS

SALES OFFICES IN: New York Chicago Detroit Boston Philadelphia and all the Principal Cities in U. S.

European representatives: Crosby Valve & Engineering Co., Ltd. 41-42 Foley Street, London, W. 1, England

Canadian representative: Darling Bros., Ltd., 120 Prince Street, Montreal, Canada

Thatcher Company, New York, announces the appointment of R. C. Cook as a member of the Heating and Ventilating Committee of the "Own-Your-Home" Exposition, to represent the National Warm-Air Heating and Ventilating Association.

Winchester Repeating Arms Co., New Haven, Conn., reports that it has taken over the radiator division of the U. S. Cartridge Company and that the entire organization of this department has removed to New Haven, Conn. Harry E. Jenkins will continue as sales manager of the radiator division and it is the intention to build up the heater business by aggressive sales methods.

York Heating and Ventilating Corp., Philadelphia, Pa., advises that E. B. Boston has become connected with its Chicago office, having been transferred from the Philadelphia office.

C. A. Dunham Co., Chicago, has appointed W. D. Hardee as its representative in northern Illinois and Indiana, all of Wisconsin and part of Iowa. His headquarters will be in Chicago. R. G. Fensch, with headquarters in St. Louis, will cover southern Illinois, and all of Iowa, Kansas, Missouri and Nebraska.

Oswego Tool Co., Oswego, N. Y., has appointed A. F. Howe, of Oakland, Cal., as Pacific Coast representative. Mr. Howe's offices are located in the Rialto Building, San Francisco.

Montgomery Bros., Chicago, announces that Walter Keiser is now connected with its organization. Mr. Keiser was formerly vice-president and sales manager of the Air Conditioning and Engineering Company of St. Louis. Montgomery Brothers are distributors for the United States Ozone Company, St. Louis, Mo.

Thomas McHenry & Son, St. Louis, Mo., now represents the Combustion Fuel Oil Burner Company, of St. Louis.

Stack Heater Co., Boston, Mass., has appointed George M. Drady sales engineer. Mr. Drady was previously connected with the Riverside Boiler Works, Cambridge, Mass.

C. F. Eveleth, for many years chief engineer of heating and ventilation for Warren, Webster & Co., Camden, N. J., has become associated with C. W. Colby & Co., Cleveland, O. C. W. Colby, president of the last-named corporation, is representative for Warren, Webster & Company in northern Ohio. In addition, this company represents the Kewanee Boiler Co., Kewanee, Ill., and the Brunswick-Kroeschell Co., Inc.

Buffalo Forge Co., and Buffalo Steam Pump Co., Buffalo, N. Y., announce that their Philadelphia office in the Land Title Building, is now in charge of W. S. Koithan and R. W. Pryor, Jr., who for many years have been joint managers of the New York office. They will continue in charge of the New York district with an enlarged engineering organization.

Fitzgibbons Boiler Co., New York, announces the appointment of the J. L. Fuller Co., 311 East Adams Ave., Detroit, Mich., as its distributors in the southern peninsula of Michigan. The appointment is also announced of Samuel H. Harper, 304 Oliver Building, Pittsburgh, Pa., as the company's distributor for the Pittsburgh district.

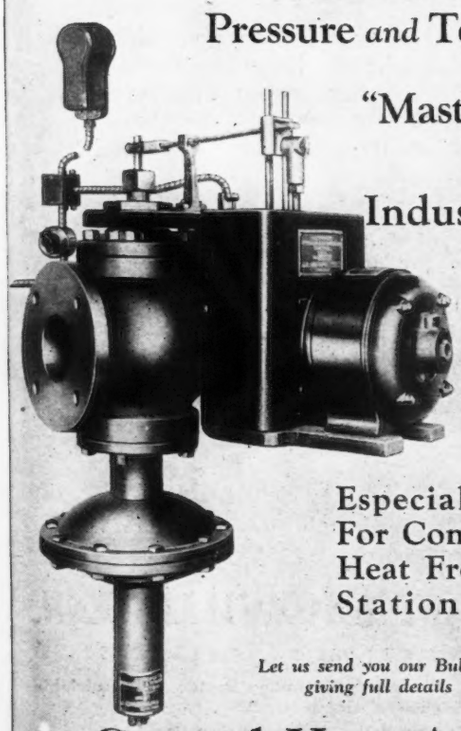
Mueller Furnace Company Holds Twenty-Fifth Annual Sales Conference

A quarter-century in sales conferences was marked by the gathering of 72 men, employees and friends of the L. J. Mueller Furnace Company, Milwaukee, at the Hotel Astor of that city on December 13. Included in this number was a group of 14 new salesmen recently added to the selling force.

A complete line of steam and water boilers and warm-air furnaces was set up on the ball-room floor, including the new gas-fired boiler and a new design of warm-air furnace. That the company expects vigorously to enter the field for gas-fired equipment was evidenced by the appearance on the program, of W. V. Turner, of the *Gas Age-Record* and W. R. Lacey of the Milwaukee Gas Light Company.

An entire day was spent at the Mueller factory watching tests and inspecting manufacturing and assembly methods. The annual banquet was held in the Venetian ball room, which had been decorated in keeping with the Christmas season.

HORNUNG
Pressure *and* Temperature
2 *in* 1
"Master Control" Valve
(PATENTED)
Industrial Type



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